

KEY

THE NATIONAL ARITHMETIC

Full Solutions to every one of the Problems

USE OF THE KEY BY PUPILS AND STUDENTS

AMERICAN BOOK COMPANY, NEW YORK
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1901

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KEY
TO
THE NATIONAL ARITHMETIC;

CONTAINING

Full Solutions to nearly all the Problems.

DESIGNED FOR THE

USE OF TEACHERS AND PRIVATE STUDENTS.

BY JOHN HERBERT SANGSTER, M.A.,

MATHEMATICAL MASTER AND LECTURER IN CHEMISTRY AND NATURAL
PHILOSOPHY IN THE NORMAL SCHOOL FOR UPPER CANADA.



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1861.

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PREFACE.

It was the original intention of the author to give, in the Key, merely a series of brief hints upon the solutions of the more difficult problems. He was led to modify this plan and to issue the work in its present form, chiefly from the consideration that as there are in the country many young persons who, from various causes, are unable to avail themselves of the advice and assistance of a teacher, it would be a great boon to these to have access to a book to which they might refer with the certainty of having every doubt removed as to the correctness of their work and methods of solution. He offers the work to his fellow-teachers with the hope that they will accord it the same favourable reception that they have so kindly given to the National Arithmetic.

TORONTO, *May*, 1861.

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(1)

d.

23328

4

93312

(6)

£

59

20

1193 s

12

14322 c

4

57291 f

PAGE.

..... 112
 114
 121
 127
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KEY TO NATIONAL ARITHMETIC.

Page 50.

(1)	(2)	(3)	(4)	(5)
d.	£	£ s.	£ s.	£ s.
23328	348	38 10	58 13	58 13
4	20	20	20	20
<u>93312 f.</u>	<u>6960 s.</u>	<u>770 s.</u>	<u>1173 s.</u>	<u>1173 s.</u>
		12	12	12
		<u>9240 d.</u>	<u>14076 d.</u>	<u>14076 d.</u>
				4
				<u>56304 f.</u>

(6)	(7)	(8)	(9)
£ s. d.	£ s. d.	cwt. qrs. lbs.	cwt. qrs. lbs.
59 13 6½	63 0 9	16 2 16	14 3 16
20	20	4	4
<u>1193 s.</u>	<u>1260 s.</u>	<u>66 qrs.</u>	<u>59 qrs.</u>
12	12	25	25
<u>14322 d.</u>	<u>15129d.</u>	<u>346</u>	<u>311</u>
4		132	118
<u>57291 f.</u>		<u>1666 lbs.</u>	<u>1491 lbs.</u>

(10)	(11)	(12)	(13)	(14)
lbs. oz. dwt. grs.	lbs. oz. dwt. grs.	grs. yrs.	mile.	yrs. d. h. m.
3 5 12 16	7 11 15 14	20	1	46 21 8 56
12	12	365	8	365
41 oz.	95	7300 dys.	8 fur.	251
20	20	24	40	276
832 dwt.	1915 dwt.	29200	320 per.	138
24	. 24	14600	5½	16811 days.
3344	7674	175200 hrs	1600	24
1664	3830		160	67252
			1760 yds.	33622
19984 grs.	45974 grs.		3	403472 hrs.
			5280 ft.	60
				24208376 min.

(15)	(16)	(17)	(18)	(19)	(20)
sq. per.	a. r. per.	sq. miles.	cub. ft.	pks.	pks.
74	46 3 12	767	767	767	797
30½	4	640	1728	2	2
2220	187 r.	30680	6136	1534 gals	1594 gals
18½	40	4602	1534	4	4
2238½ sq. yds.	7492 per.	490880 sq. a.	5369	6136 qts.	6376 qts.
	30½				2
	224760		1325376 cub. in.		
	1873				12752 pts.
	226633 sq. yds.				

Page 51.

(1)	(2)	(3)
f.	grs.	yds.
4)32756	24)23547	5½)397024
		2
12)8189 d.	20)981 dwt. 3 grs.	11)794048
20)682s. 5d.	12)49 oz. 1 dwt. 3 grs.	40)72186r. 2hf-yds.=1yd.
£34 2s. 5d.	4 lbs. 1 oz. 1 dt. 3 g.	8)1804 fur. 26 r. 1 yd.
		225 m. 4 f. 26 r. 1 y.

(14)

ys. d. h. m.
46 21 8 56
365

251
76
3

311 days.
24

252
22

472 hrs.
60
376 min.

(20)

pks.
797
2
1594 gals
4

6376 qts.
2
12752 pts.

(4)

sec.
60)28635

60)477 m. 15 sec.

7 hrs. 57 m. 15 sec. 16 cwt. 2 q. 16 lbs. 14 cwt. 3 q. 16 lbs.

(7)

grs.
24)115200

20)4800 dwt.

12)240 oz.

20 lbs.

(5)

lbs.
25)1666

4)66 qrs. 16 lbs.

(8)

oz.
16)107520

6720 lbs.

(9)

cub. in.
1728)1674674

969 ft. 242 in.

(10)

Fl. e.
767
3

4)2301 qrs.

575 yds. 1 qr.

(11)

ft.
3)183810

51)61270 yds.
2) 2

11)122540

40)11140 per.

8)278 fur. 20 per.

3)34 m. 6 fur. 20 per.

11 lea. 1 m. 6 fur. 20 per.

(12)

cub. in.
1728)138297

27)80 ft. 57 in.

2 c. yds. 26 c. ft. 57 c. in.

(13)

cub. ft.
128)67893

530 cord 53c.ft.

(14)

sec.
60)3561829

60)59363 m. 49 sec.

24)989 h. 23 m. 49 s.

7)41 d. 5 h. 23 m. 49 s.

5 wks. 6 days 5 hrs. 23 min. 49 sec.

(15)

qts.
4)1597

2)399 gals. 1 qt.

4)199 pks. 1 gal. 1 qt.

49 bush. 3 pecks 1 gal. 1 qt.

(16)

c. ft.
8)1000

125 cords

nf-yds.=1yd.
r. 26 r. 1 yd.
4 f. 26 r. 1 y.

(17)
seconds.
60)10000

60) 186' 40".

2° 46' 40"

(18)
sq. links.
10000)70000

7 sq. ch.

(19)
grs.
20)11521

3)576 scr. 1 gr.

g) 192 dr. 1 gr.

12) 24 oz. 1 gr.

2 lbs. 1 gr.

(20)
sq ft.
9)26025

30 $\frac{1}{4}$)2891 yds. 6 ft.
4) 4

121)11564 quarter yards.

95 per. 69 quar. yds. 6 ft. =

40)95 per. 17 yds. 8 ft. 36 in.

2 r. 15 sq. p. 17 sq. y. 8 sq. ft. 36 sq. in.

Page 53.

(1)	(2)
$\pounds 3 \times 400 = 1200 \text{ cents.}$	$\pounds 29 \times 400 = \116.00
$7s. \times 20 = 140 \text{ "}$	$18s. \times 20 = 3.60$
$1\frac{1}{2}d. = 5 \text{ far.} \times 5 \div 12 = 2\frac{1}{2} \text{ "}$	$3\frac{1}{2}d. = 14 \text{ far.} \times 5 \div 12 = 05\frac{1}{2}$

$$\text{£}3\ 7\text{s.}\ 1\frac{1}{2}\text{d.} = 1342\frac{1}{2}\text{ cts.} \quad \text{£}29\ 18\text{s.}\ 3\frac{1}{2}\text{d.} = \$119.65\frac{5}{8}$$

(3)

$$11\frac{1}{2}d. = 45 \text{ far.} \times 5 \div 12 = 18\frac{3}{4} \text{ cts.}$$

(4)		(5)	
£69	× 400 = \$276.00	18s. × 20 = \$3.60	
15s.	× 20 = 3.00	8½d. = 34 far. × 5 ÷ 12 = .14½	
6d. = 24 far.	× 5 ÷ 12 = .10	18s. 8½d. = \$3.74½	
£69 15s. 6d. = \$279.10			

Pages

53d. =

 $2d. = 8$

(25)

\$169.

12

2037 •

3

\$6112.

(29)

£ 3 s. 7

20 5

60 15

scr. 1 gr.

dr. 1 gr.

oz. 1 gr.

lbs. 1 gr.

ft. 36 sq. in.

2)

00 = \$116.00

20 = 3.60

12 = .05½

d. = \$119.65½

5)

× 20 = \$3.60

÷ 12 = .14½

8½d. = \$3.74½

(6)

$$£17 \times 400 = \$68.00$$

$$16s. \times 20 = 3.20$$

$$5½d. = 23 \text{ far.} \times 5 \div 12 = .09\frac{7}{12}$$

$$£17 \text{ } 16s. \text{ } 5½d. = \$71.29\frac{7}{12}$$

(7)

$$£87 \times 400 = \$348.00$$

(8)

$$15s. \times 20 = \$3.00$$

$$11½d. = 47 \text{ far.} \times 5 \div 12 = .19\frac{7}{12}$$

$$15s. \text{ } 11½d. = \$3.19\frac{7}{12}$$

(9)

$$£16 \times 400 = \$64.00$$

$$6s. \times 20 = 1.20$$

$$2d. = 8 \text{ far.} \times 5 \div 12 = .03\frac{1}{3}$$

$$£16 \text{ } 6s. \text{ } 2d. = \$65.23\frac{1}{3}$$

(10)

$$£2 \times 400 = \$8.00$$

$$9s. \times 20 = 1.80$$

$$11d. = 44 \text{ far.} \times 5 \div 12 = .18\frac{1}{3}$$

$$£2 \text{ } 9s. \text{ } 11d. = \$9.98\frac{1}{3}$$

Page 90.

(25)

$$36 = 12 \times 3$$

$$\$169.78$$

$$12$$

$$2037.36$$

$$3$$

$$\$6112.08$$

(26)

$$121 = 11 \times 11$$

$$796342.3$$

$$11$$

$$8759765.3$$

$$11$$

$$96357418.3$$

(27)

$$144 = 12 \times 12$$

$$\$33460$$

$$12$$

$$401520$$

$$12$$

$$\$4818240$$

(28)

$$643 = 12 \times 9 \times 6$$

$$735$$

$$12$$

$$8820$$

$$9$$

$$79380$$

$$6$$

$$476280$$

(29)

$$18 = 6 \times 3$$

$$£ \text{ } s. \text{ } d.$$

$$3 \text{ } 7 \text{ } 6$$

$$6$$

$$20 \text{ } 5 \text{ } 0$$

$$3$$

$$60 \text{ } 15 \text{ } 0$$

(30)

$$22 = 11 \times 2$$

$$£ \text{ } s. \text{ } d.$$

$$5 \text{ } 14 \text{ } 6\frac{1}{2}$$

$$11$$

$$62 \text{ } 19 \text{ } 11\frac{1}{2}$$

$$2$$

$$125 \text{ } 19 \text{ } 11$$

(31)

$$810 = 10 \times 9 \times 9$$

$$£ \text{ } s. \text{ } d.$$

$$3 \text{ } 4 \text{ } 7$$

$$10$$

$$32 \text{ } 5 \text{ } 10$$

$$9$$

$$290 \text{ } 12 \text{ } 6$$

$$9$$

$$2615 \text{ } 12 \text{ } 6$$

(32)

$$54 = 9 \times 6$$

$$\text{cwt. qrs. lbs. oz.}$$

$$11 \text{ } 3 \text{ } 14 \text{ } 7$$

$$9$$

$$107 \text{ } 0 \text{ } 4 \text{ } 15$$

$$6$$

$$642 \text{ } 1 \text{ } 4 \text{ } 10$$

(33)

$$49 = 7 \times 7$$

bush.	pk.	gal.	qt.	pt.
26	3	1	1	1
7				

188	1	1	2	1
7				

1319	0	1	1	1
------	---	---	---	---

(34)

$$63 = 9 \times 7$$

yds.	qrs.	na.	in.
2	2	2	2
9			

24	0	2	0
7			

168	3	2	0
-----	---	---	---

(35)

$$288 = 12 \times 12 \times 2$$

dys.	hrs.	min.	sec.
5	17	33	11
12			

68	18	38	12
12			

825	7	38	24
2			

1650	15	16	48
------	----	----	----

(40)

$$83 = 3 + 10 \times 8$$

£	s.	d.	£	s.	d.
12	2	4	36	7	0
10					

121	3	4	8	969	6	8
-----	---	---	---	-----	---	---

1005	13	8
------	----	---

(41)

$$999 = 10 \times 10 \times 10 - 1$$

£	s.	d.
963	0	0½
10		

9630	0	7½
10		

96300	6	3
10		

963003	2	6
963	0	0½

962040	2	5½
--------	---	----

(42)

$$3178 = 8 + 10 \times 7 + 10 \times 10 \times 1 + 10 \times 10 \times 10 \times 3$$

£	s.	d.	£	s.	d.
3	6	5½	26	11	6
10					

33	4	4½	7	232	10	7½
10						

332	3	9	1	332	3	9
10						

3321	17	6	3	9965	12	6
------	----	---	---	------	----	---

10556	18	4½
-------	----	----

(43)

$$678 = 8 + 10 \times 7 + 10 \times 10 \times 6$$

bush.	pk.	gal.	bush.	pk.	gal.
16	3	1	135	0	0
10					

168	3	0	7	1181	1	0
10						

1687	2	0	6	10125	0	0
------	---	---	---	-------	---	---

11441	1	0
-------	---	---

(52)

707

55

4242

35355

35355

393147

(61)

3.25

.02

975

6503

.07478

(35)
 $2 \times 12 \times 2$
 s. min. sec.
 $7 \ 33 \ 11$
 $\underline{12}$
 $3 \ 38 \ 12$
 $\underline{12}$
 $7 \ 38 \ 24$
 $\underline{2}$
 $5 \ 16 \ 48$

(4)
 $0 \times 10 - 1$
 s. d.
 $0 \ 0\frac{1}{2}$
 $\underline{10}$
 $0 \ 7\frac{1}{2}$
 $\underline{10}$
 $0 \ 6 \ 3$
 $\underline{10}$
 $3 \ 2 \ 6$
 $3 \ 0 \ 0\frac{1}{2}$
 $0 \ 2 \ 5\frac{1}{2}$

$4-10 \times 10 \times 6$
 bush. pk. gal.
 $135 \ 0 \ 0$

$1181 \ 1 \ 0$

$10125 \ 0 \ 0$

$11441 \ 1 \ 0$

(44)
 $247 = 7 + 10 \times 4 + 10 \times 10 \times 2$
 m. fur. rds. yds.
 $23 \ 6 \ 33 \ 4 \times 7 = 166 \ 7 \ 36 \ 0\frac{1}{2}$
 $\underline{10}$
 $238 \ 4 \ 17 \ 1\frac{1}{2} \times 4 = 954 \ 1 \ 29 \ 0\frac{1}{2}$
 $\underline{10}$
 $2385 \ 4 \ 12 \ 4 \times 2 = 4771 \ 0 \ 25 \ 2\frac{1}{2}$
 $\underline{5892 \ 2 \ 10 \ 3\frac{1}{2}}$

(45)
 $721 = 1 + 10 \times 2 + 10 \times 10 \times 7$
 s. deg. min. sec.
 $3 \ 16 \ 30 \ 45 \times 1 = 3 \ 16 \ 30 \ 45$
 $\underline{10}$
 $35 \ 15 \ 7 \ 30 \times 2 = 71 \ 0 \ 15 \ 0$
 $\underline{10}$
 $355 \ 1 \ 15 \ 0 \times 7 = 2485 \ 8 \ 45 \ 0$
 $\underline{2559 \ 25 \ 30 \ 45}$

(52)	(53)	(54)	(55)
7071	15607	39948123	2778588
558	3094	6007	9867
$\underline{42426}$	$\underline{62428}$	$\underline{279636861}$	$\underline{19450116}$
35355	140463	23968873800	16671528
35355	468210	239968374861	22228704
$\underline{3931476}$	$\underline{48288058}$		$\underline{25007292}$
			$\underline{27416327796}$

(61)	(62)	(63)	(64)	(65)
3.2517	64.001	482000	3782.4	87.96
.023	340	.37	.00917	220
$\underline{97551}$	$\underline{2560040}$	$\underline{3374000}$	$\underline{264768}$	$\underline{175920}$
65034	192003	1446000	37824	17592
$\underline{.0747891}$	$\underline{21760340}$	$\underline{178340.00}$	$\underline{340416}$	$\underline{19351.20}$
			$\underline{34.684608}$	

(66)	(67)	(68)	(69)
216 = 6 × 6 × 6	\$61135.37	255 126	176 = 11 × 8 × 2
	229	143	
\$83469			203736
6	55021833	765678	11
	12227074	1020904	
500814	12227074	255226	2241096
6			8
3004884	\$13999999.73	36497318	17928768
6			2
\$18029304			35857536

(70)	(71)	(72)	(73)
116700	3721	297 = 11 × 9 × 3	35 = 7 × 5
235	73	32000	9344000
		11	7
583500	11163		
350100	26047	352000	65408000
233400		9	5
	271633		
27424500		3168000	327040000
		3	
		9504000	

(74)	(75)
749 = 9 + 10 × 4 + 10 × 10 × 7	999998 = 1000000 - 2
lbs. oz. drs. scr. gr.	lbs. oz. drs. scr. grs.
123 4 7 2 17 × 9 = 1110	8 7 1 13
10	
1234 1 7 1 10 × 4 = 4936	7 6 0 0
10	
12341 7 3 0 0 × 7 = 86391	3 5 0 0
92438 8 2 1 13	

1143 =
yds. 0
7

79

790

7902

(69)

$$= 11 \times 8 \times 2$$

$$\begin{array}{r} 203736 \\ 11 \\ \hline 2241096 \\ 8 \\ \hline 17928768 \\ 2 \\ \hline 35857536 \end{array}$$

(73)

$$35 = 7 \times 5$$

$$\begin{array}{r} 9344000 \\ 7 \\ \hline 65408000 \\ 5 \\ \hline 327040000 \end{array}$$

(75)

$$= 1000000 - 2$$

$$\begin{array}{r} 98732 \\ 00000 \\ \hline 98732000000 \\ 3397464 \\ \hline 98728602536 \end{array}$$

(76)

$$€40 = 10 \times 8 \times 8$$

bush. pk. gal. qt. pt.

$$\begin{array}{r} 123 \quad 1 \quad 1 \quad 1 \quad 1 \\ \hline 10 \\ \hline 1234 \quad 0 \quad 1 \quad 3 \quad 0 \\ \hline 8 \\ \hline 9873 \quad 3 \quad 0 \quad 0 \quad 0 \\ \hline 8 \\ \hline 78990 \quad 0 \quad 0 \quad 0 \quad 0 \end{array}$$

(78)

$$1143 = 3 + 10 \times 4 + 10 \times 10 \times 1 + 10 \times 10 \times 10 \times 1$$

yds. qrs. na. in. yds. qrs. na. in.

$$\begin{array}{r} 7 \quad 3 \quad 2 \quad 1 \times 3 = 23 \quad 2 \quad 3 \quad 0\frac{1}{2} \\ \hline 10 \\ \hline 79 \quad 0 \quad 0 \quad 1 \times 4 = 316 \quad 0 \quad 1 \quad 1\frac{1}{2} \\ \hline 10 \\ \hline 790 \quad 1 \quad 0 \quad 1 \times 1 = 790 \quad 1 \quad 0 \quad 1 \\ \hline 10 \\ \hline 7902 \quad 3 \quad 0 \quad 1 \times 1 = 7902 \quad 3 \quad 0 \quad 1 \\ \hline 9032 \quad 3 \quad 2 \quad 0 \end{array}$$

(80)

$$\begin{array}{r} \$968.49 \\ 3.4 \\ \hline 387396 \\ 290547 \\ \hline \$3292.866 \end{array}$$

$$\begin{array}{r} \$12183.6042 \\ 3292.866 \\ 968.49 \\ \hline \$16444.9602 \end{array}$$

(77)

$$\begin{array}{r} 89 \\ .73 \\ \hline 267 \\ 623 \\ \hline \$64.97 \end{array}$$

(79)

$$\begin{array}{r} 1634.5789 \\ 635000 \\ \hline 81728945000 \\ 49037367 \\ 98074734 \\ \hline 1037957601.5 \end{array}$$

$$\begin{array}{r} \$3292.866 \\ 3.7 \\ \hline 23050062 \\ 9878598 \\ \hline \$12183.6042 \end{array}$$

Page 110.

(18)

6423)798965(134²₁³₂
6423
 15666
12846
 28205
25692
 2513

(19)

£ s. d.
 12)178 14 6
14 14 6

(20)

741)56789(764¹₁
5187
 4919
4446
 473

(21)

7894)6785158(8594¹₁
63152
 46995
39470
 75258
71046
 4212

(22)

£ s. d. £ s. d.
 317)4728 16 2(14 18 4¹₁

317
1558
 1268
290
 29
5816
 317
2646
 2536
110
 12
1322
 1268
54

(24)

6)970763
161793 8333+

(25)

9)71234
7914

(23)

429)\$97896·64(\$228·19¹₁

858
1209 47600)977076(2044¹₁
 858
3516
 3432
84·6
 42·9
41·74
 38·61
3·13

(26)

95200
25076

498)

4

2

1

-

3

3

-

2

2

-

6

5

-

25=

5)376

5)75

15

3X5-

(27)										(29)													
lbs.	oz.	drs.	scr.	grs.	lbs.	oz.	drs.	scr.	grs.	9712)7867674(8109713													
498)7289	6	4	2	13	(14	7	5	0	12437	77696													
498										9807													
2309										9712													
1992										954													
(28)										(30)													
	£	s.	d.	s.	d.	m. fur. rds. m. fur. rds.																	
317	487)	157	16	7	(6	54	...	59	437	37)422 3 38(11 3 14													
12	20					407																	
3810	3156					15																	
3486	2922					8																	
324	234					123																	
8	12					111																	
2596	2815					12																	
2490	2435					40																	
106	380					518																	
3	4					37																	
320	1520					148																	
20	1461					148																	
6413	59																						
5976																							
437																							

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(32)			(33)			(34)			(35)		
25=5×5			42=7×6			96=12×8			24=12×2		
5)3766			7)26406			12)25431			£ s. d.		
5)753... 1			6)3772... 2			8)2119... 3			12)24 17 6		
150... 3			628... 4			264... 7			2)2 1 54		
3×5+1=16			4×7+2=30			7×12+3=87			1 0 84		
15048			62848			26487					

(36)

$$49 = 7 \times 7$$

$$\begin{array}{r} \text{£} \text{ s. d.} \\ 7) 740 \text{ } 13 \text{ } 4 \end{array}$$

$$7) 105 \text{ } 16 \text{ } 2\frac{1}{2} \dots 1$$

$$\begin{array}{r} 15 \text{ } 2 \text{ } 3\frac{1}{2} \dots \frac{1}{4} \end{array}$$

(37)

$$56 = 8 \times 7$$

$$\begin{array}{r} \text{£} \text{ s. d.} \\ 8) 54\frac{1}{2} \text{ } 12 \text{ } 4 \end{array}$$

$$7) 68 \text{ } 9 \text{ } 0\frac{1}{2}$$

$$\begin{array}{r} 9 \text{ } 15 \text{ } 6\frac{1}{2} \dots \frac{1}{10} \end{array}$$

(38)

$$35 = 7 \times 5$$

$$7) 6789436$$

$$5) 969919 \dots 3$$

$$193983 \dots 4$$

$$4 \times 7 + 3 = 31$$

$$193983\frac{3}{4}$$

(39)

$$147 = 7 \times 7 \times 3$$

$$7) 753293$$

$$7) 107613 \dots 2$$

$$3) 15373 \dots 2$$

$$5124 \dots 1$$

$$1 \times 7 \times 7 + 2 \times 7 + 2 = 65$$

$$5124\frac{65}{47}$$

(40)

$$81 = 9 \times 9$$

$$\text{lbs. oz. dwt. grs.}$$

$$9) 1798 \text{ } 6 \text{ } 11 \text{ } 9$$

$$9) 199 \text{ } 10 \text{ } 1 \text{ } 6 \dots 3$$

$$22 \text{ } 2 \text{ } 9 \text{ } 0 \dots 6$$

$$6 \times 9 + 3 = 57$$

$$22 \text{ lbs. } 2 \text{ oz. } 9 \text{ dwt. } 0\frac{57}{1} \text{ grs.}$$

(43)

$$\text{£} \text{ s. d.}$$

$$491 \text{ } 12 \text{ } 0\frac{1}{2}$$

$$20$$

$$9832$$

$$12$$

$$117984$$

$$4$$

$$471937$$

)

$$\text{£} \text{ s. d.}$$

$$8968 \text{ } 13 \text{ } 7\frac{1}{2}$$

$$20$$

$$179373$$

$$12$$

$$2152483$$

$$4$$

$$8609934$$

$$471937$$

$$3890564$$

$$3775496$$

$$115068$$

(44)

$$\text{m. fur. rds.}$$

$$17 \text{ } 5 \text{ } 27$$

$$8$$

$$141$$

$$40$$

$$5667$$

$$\text{m. fur. rds.}$$

$$1027 \text{ } 1 \text{ } 6$$

$$8$$

$$8217$$

$$40$$

$$328686$$

$$28335$$

$$45336$$

$$45336$$

$$(58$$

(38)
 7×5
 89436
 69919...3
 93983...4
 $\times 7 + 3 = 31$
 193983 $\frac{1}{11}$

(40)
 $= 9 \times 9$
 dwt. grs.
 11 9
 1 6...3
 9 0...6
 $= 57$
 wt. 0 $\frac{1}{11}$ grs.

(44)
 m. fur.rds.
 1027 1 6
 8
 8217
 40
 8686 (58
 335
 5336
 5336

(45)

$\frac{d}{s}$	s.	d.	)	$\frac{d}{s}$	s.	d.	dwt. grs.	lbs.	oz.	dwt. grs.
57	0	7 $\frac{1}{2}$	)	171	1	10 $\frac{1}{2}$	5 9)	9	9	3 12
20				20			24	12		
1140				3421			129	117		
12				12				20		
13687				41062				2343		
4				4				24		
								9384		
								4686		
54750	)			164250	(3			129)56244	(436	
				164250				516		

(47)

a.	r.	per.	)	a.	r.	per.
91	0	6	)	2366	3	36
4				4		
364				9467		
40				40		
14566	)			378716	(26	
				29132		
				87396		
				87396		

(57)

$$756 \cdot 98 \div 76 \cdot 73612 =$$

$$7673612)75698000(9 \cdot 864 +$$

$$69062508$$

$$6635492 \cdot 0$$

$$6138889 \cdot 6$$

$$496602 \cdot 40$$

$$460416 \cdot 72$$

$$36185 \cdot 680$$

$$30694 \cdot 448$$

$$5491 \cdot 232$$

(58)

$$47 \cdot 5782975 \div 26 \cdot 175 =$$

$$26175)47578 \cdot 2975(1 \cdot 8177$$

$$26175$$

$$21403 \cdot 2$$

$$20940 \cdot 0$$

$$463 \cdot 29$$

$$261 \cdot 75$$

$$201 \cdot 547$$

$$183 \cdot 225$$

$$18 \cdot 3225$$

$$18 \cdot 3225$$

$$\begin{array}{r}
 (59) \\
 1 \div 7.6345 = \\
 76345) 10000.0(0.1309+ \\
 \underline{76345} \\
 236550 \\
 \underline{229035} \\
 751500 \\
 687105
 \end{array}$$

$$\begin{array}{r}
 (60) \\
 75.347 \div 0.3829 = \\
 3829) 753470(196.7798 + \\
 \underline{3829} \\
 37057 \\
 \underline{34461} \\
 25960 \\
 \underline{22974} \\
 29860 \\
 \underline{26803} \\
 30570 \\
 \underline{26803} \\
 37670 \\
 \underline{34461} \\
 32090 \\
 \underline{30632} \\
 1458
 \end{array}$$

$$\begin{array}{r}
 (61) \\
 .0002 \div .000000008 = \\
 8) 200000 \\
 \underline{25000}
 \end{array}$$

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$$\begin{array}{r}
 (61) \quad (62) \\
 95) \$3300000(\$34736.8421 \quad 126) \$3860000(\$30634.9206 \\
 \underline{285} \quad (63) \text{ dys. } 378 \\
 28800) 95270400(3308 \\
 \underline{450} \quad 86400 \quad 800 \\
 \underline{380} \quad 88704 \quad 756 \\
 700 \quad 86400 \quad 440 \\
 \underline{665} \quad 230400 \quad 378 \\
 350 \quad 230400 \quad 620 \\
 \underline{285} \quad 604 \\
 \text{days.} \\
 650 \quad 365\frac{1}{4}) 3308 \quad 116.0 \\
 \underline{570} \quad 4 \quad 4 \quad 113.4 \\
 80.0 \quad 1461) 13232(9 \quad 20\frac{1}{4} \quad 2.60 \\
 \underline{76.0} \quad 13149 \quad 2.52 \\
 4.00 \quad 4) 83 \quad .800 \\
 \underline{3.80} \quad . \quad .756 \\
 20\frac{1}{4} \quad .044 \\
 .200 \\
 .190 \\
 .100 \\
 \underline{.095} \\
 .005
 \end{array}$$

$$\begin{array}{r}
 (64) \\
 35781628) \$1145012096(\$32 \\
 \underline{107344884} \\
 71563256 \\
 \underline{71563256}
 \end{array}$$

2747

2943

978.
963476

(61)

00000008=

000000

25000

30634 9206

0

2

00

56

44

996(\$32

34

56

56

(65)	(66)	(67)	(70)
27475271)\$3764112127(\$137	9)\$972	108)\$972(\$9	1728)1000(.578 oz.
27475271	\$108	972	864.0
101658502	(69)	136.00	
82425813	792)340480(4297 $\frac{1}{2}$ oz.	120.96	
192326897	3168		
192326897	2368		
(68)	1584		
294)\$8526(\$29	(72)		
588	19)4750(2501bs. 15.040		
m. fur.	7840	13.824	
2646 33 2	7128		
2646 8	95	1.216	
266	712		
40	95		
10640	(74)		
54	bush. pk. gal. qt. pt. bush. pk. gal. qt. pt.		
53200	297)729 1 1 1 1 (2 1 1 2 1 1		
5320	594		
1155)58520(50.770	135		
5775	4		
770	541		
50.770=503.	297		
(73)	244		
978.634÷96.34762 =	2		
9634762)97863400(10.157	489		
9634762	297		
1515780.0	192		
963476.2	4		
552303.80	769		
481738.10	594		
70565.700	175		
67443.334	2		
3122.366	351		
	297		
	54		

54 = 11.

(75)				(76)			
lbs.	oz.	dr.	cwt.	qr.	lbs.	oz.	dr.
9	7	8	)	179	3	4	16 0
16			4				
151			719		m. fur. rds.	m.	
16			25		93	4	7
914			3599		8		8
151			1438		748		200000
2424			17979		40		40
			16			dys.	hrs.
			107890		29927	8000000	(267 745334)
			17979				
			287680				
			16				
			1726080				
			287680				
2424			4602880				
			2424				
			21788				
			19392				
			23968				
			21816				
			21520				
			19392				
			2128				

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(3)

DOCC. MVCCCLXXVI, MXOMXCIX, LXXXVMIV,
 MMMXXLVMMDXCVI,

£729×40
 170×20
 64d.=25

(4)

$$\begin{array}{r}
 72=8 \times 9 \\
 \text{lbs. oz.} \\
 749 \ 10 \\
 \underline{\quad 8} \\
 5997 \ 0 \\
 \underline{\quad 9} \\
 53973 \ 0
 \end{array}$$

(5)

$$\begin{array}{r}
 17=7+10 \times 1 \\
 \text{s. d.} \quad \text{£ s. d.} \\
 4 \ 7\frac{1}{2} \times 7=1 \ 12 \ 6\frac{1}{2} \\
 \underline{\quad 10} \\
 \text{£} 2 \ 6 \ 5\frac{1}{2} \times 1=2 \ 6 \ 5\frac{1}{2} \\
 \underline{\quad \quad \quad} \\
 3 \ 18 \ 11\frac{1}{2}
 \end{array}$$

ys. hrs.
67 718334

(6)

$$\begin{array}{r}
 30)2850000000 \\
 \hline
 24)950000000(3958333 \ 8 \\
 \quad 72 \\
 \quad \hline
 \quad 230 \quad 365\frac{1}{2})3958333(10837 \\
 \quad 216 \quad \quad \quad 4 \quad \quad \quad 4 \\
 \quad \hline
 \quad 140 \quad 1461)15833332 \\
 \quad 120 \quad \quad \quad 1461 \\
 \quad \hline
 \quad 200 \quad \quad \quad 12233 \\
 \quad 192 \quad \quad \quad 11688 \\
 \quad \hline
 \quad 80 \quad \quad \quad 5453 \\
 \quad 72 \quad \quad \quad 4383 \\
 \quad \hline
 \quad 80 \quad \quad \quad 10702 \\
 \quad 72 \quad \quad \quad 10227 \\
 \quad \hline
 \quad 80 \quad \quad \quad 4)475 \text{ quarter days.} \\
 \quad 72 \quad \quad \quad \text{days. hrs.} \\
 \quad \hline
 \quad \quad \quad 118\frac{1}{2}=118 \ 18 \\
 \quad \quad \quad 8 \text{ rem.} \quad \text{Add} \quad \quad 8 \\
 \quad \quad \quad \hline
 \quad \quad \quad 119 \ 2
 \end{array}$$

10837 yrs. 119 days, 2 hrs.

XXXV MIV,

(7)

$$\begin{array}{r}
 \text{£} 729 \times 400 = \$2916 \cdot 00 \\
 170 \times 20 = 3 \cdot 40 \\
 6\frac{1}{2} \text{d.} = 25 \text{ far.} \times 5 \div 12 = 10\frac{1}{2} \\
 \hline
 \$2919 \cdot 50\frac{1}{2} \\
 \text{B}
 \end{array}$$

(8)

$$\begin{array}{r}
 \$10000 \\
 9876 \cdot 23 \\
 \hline
 \$123 \cdot 77
 \end{array}$$

(10)

in.
 12) 7964327

 12) 663693-11 } 119 in.

 55307-9 }
 9) 55307 ft. 119 in.

 304) 6145 yds. 2 ft. 119 in.

 4 4

(11)

\$729.43
 16.70
 976.81
 9987.17
 429.00
 129.19

 \$12268.30

121) 24580 203 p. 44 y. = 203 p. 4 yds. 2 ft. 36 in.
 11) 24580 Add 2 ft. 119 in.

11) 2234-6 }

 203-1 } 17 qr. yds.

40) 203 p. 4 yds. 5 ft. 11 in.

 4) 5 fur. 3 p. 4 yds. 5 ft. 11 in.

 1 m. 1 f. 3 p. 4 yds. 5 ft. 11 in.

(12)

$$429 = 9 + 10 \times 2 + 10 \times 10 \times 4$$

wks.	dys.	hrs.	min.	wks.	dys.	hrs.	min.
6	4	3	17	9	59	2	5
			10				33

65	6	8	50	2	131	5	17	40
			10					

659	0	16	20	4	2636	2	17	20
					2827	3	16	33

wks.

52) 2827 (54 yrs. 19 wks. 3 dys. 16 hrs. 33 min.)

260

227

208

19 wks.

(1)
781576
31584

033162

(18)

a.	a.
25	73
197	67
156	
97	5
199	

674

(15)

	tons.
324	
20	
cwt. qr. lbs.	—
13 2 14	6480
4	4
54	25920
25	25

284	129600
108	51840

1364	) 648000	(475-188 = 475-188 = 287 hds.
	5456	

(14)	
78-96	10240
00042	9548

15792	6920
31584	6820
0331632	100

(16)

\$136
\$136 × 4 = 544 - 95 = 449
1902
2487
\$9237 - \$2487 = \$6750

(17)

yds. qrs. na.	yds. qrs. na.
3 1 2) 39 2 3	
4	4
13	158
4	4
54) 635(11½	
	54
	95
	54
	41

(18)

(19)

a.	a.	a. r. per.
25	732	96 3 17
197	674	4
156		
97	58	387
199		40
674	15497	\$7764-0 (\$0-501
		7748-5

(20)

\$	
20	\$312
75	275
97	
83	\$ 37
275	

(21)

lbs. oz. dwt. grs.
12)36 8 14 16
3 0 14 13½

(22)

a. r. per.
6 3 12
7 2 0
9 0 13
5 2 36
29 0 21

15-500
15-497
3

(23)

(24)

(25)

5	lbs. oz. dwt. grs.	$£972 \times 400 = \$3888.00$
7	5 9 8 0	$11s. \times 20 = 2.20$
9	3 2 16 16	$11\frac{1}{2}d. = 45 \text{ far.} \times 5 \div 12 = .18\frac{1}{2}$
<u>21</u>	4 6 17 0	
21)294(14	1 8 19 22	$\$3890.38\frac{1}{2}$
21		
<u>84</u>	15 4 1 14	
84		

(26)

(27)

(28)

lbs. oz. drs. scr. grs.	56	cwt. qr. lbs.
179 3 3 1 14	25	6 2 11
12	<u>280</u>	5 3 16
<u>2151 oz.</u>	112	8 0 7
8	<u>1400</u>	3 1 17
<u>17211 drs.</u>	2	lbs.
3		24 0 1 = 2401
<u>51634 scr.</u>	2800 sq. ft. in roof.	.15
20	6	12005
<u>1032694 grs.</u>	16800	2401
		$\$360.15$

(29)

(30)

29	\$	\$
57	139468	370129
<u>203</u>	98579	238047
145	<u>\$238047</u>	<u>\$132082</u>
1653		
<u>.15</u>		
8265		
1653		
<u>\$247.95</u>		

$$\begin{array}{r} 0 = \$3888.00 \\ 0 = 2.20 \\ 12 = .18\frac{1}{2} \\ \hline \$3890.38\frac{1}{2} \end{array}$$

$$\begin{array}{r} \text{r. lbs.} \\ 2 \ 11 \\ 3 \ 16 \\ 0 \ 7 \\ 1 \ 17 \\ \hline \text{lbs.} \\ 0 \ 1 = 2401 \\ \hline .15 \\ \hline 12005 \\ 2401 \\ \hline \$360.15 \end{array}$$

$$\begin{array}{r} (31) \\ \begin{array}{r} \text{£ s. d.} \\ 9 \ 19 \ 11\frac{1}{2} \\ 20 \\ 199 \\ 12 \\ 2399 \\ 84 \\ 9659 \\ 19192 \\ 201579 \end{array} \quad \begin{array}{r} \text{£ s. d.} \\ 1694 \ 16 \ 0\frac{1}{2} \\ 20 \\ 33896 \\ 12 \\ 406752 \\ 84 \\ 1627030 \\ 3254016 \\ 34167190(169.49 \\ 201579 \\ 1400929 \\ 1209474 \\ 1914550 \\ 1814211 \\ 100339.0 \\ 80631.6 \\ 19707.40 \\ 18142.11 \\ 1565.29 \end{array} \end{array}$$

$$\begin{array}{r} (34) \\ \begin{array}{r} \text{cwt. qr. lbs.} \\ 2 \ 0 \ 17 \\ 3 \ 2 \ 15 \\ 2 \ 1 \ 20 \\ 5 \ 3 \ 17 \\ \hline \text{lbs.} \\ 14 \ 0 \ 19 = 1419 \\ \hline .37\frac{1}{2} \\ \hline 9933 \\ 4257 \\ 709\frac{1}{2} \\ \hline \$532.12\frac{1}{2} \end{array} \end{array}$$

$$\begin{array}{r} (32) \\ \begin{array}{r} \text{£} 19 \times 400 = \$76.00 \\ 19\text{s.} \times 20 = 3.80 \\ 11\frac{1}{2}\text{d} = 47\text{far.} \times 5 \div 12 = .19\frac{1}{3} \\ \hline \$79.99\frac{1}{3} \end{array} \end{array}$$

$$\begin{array}{r} (33) \\ \begin{array}{r} \text{cwt. qr. lbs.} \quad \text{cwt. qr. lbs.} \\ 3 \ 2 \ 11 \quad 12 \ 0 \ 0 \\ 4 \ 1 \ 15 \quad 8 \ 0 \ 1 \\ \hline \text{lbs.} \\ 8 \ 0 \ 1 \quad 3 \ 3 \ 24 = 399 \\ \hline .15 \\ \hline 1995 \\ 399 \\ \hline \$59.85 \end{array} \end{array}$$

$$\begin{array}{r} (36) \\ 43.2 \div 76.8437 = \\ 768437)432000.0(0.562 \\ 384218.5 \\ \hline 47781.50 \\ 46106.22 \\ \hline 1675.280 \\ 1536.874 \\ \hline 138.406 \end{array}$$

(37)

$$\begin{array}{r}
 123 \cdot 4 \div \cdot 000000066 = \\
 123400000000 \div 66 \\
 6) 123400000000 \\
 \hline
 11) 20566666666 \cdot 666 \\
 \hline
 1869696969 \cdot 69
 \end{array}$$

(38)

$$\begin{array}{r}
 \$63 \cdot 29 \quad \$2789 \cdot 27 \\
 17 \quad 1075 \cdot 93 \\
 \hline
 44303 \quad \$1713 \cdot 34 \\
 6329 \\
 \hline
 \$1075 \cdot 93
 \end{array}$$

(39)

$$\begin{array}{r}
 £29 \times 400 = \$116 \cdot 00 \quad \$278 \cdot 43 \\
 68 \cdot \times 20 = 1 \cdot 20 \quad 417 \cdot 16 \\
 11 \frac{1}{2} d. = 47 far. \times 5 \div 12 = \cdot 19 \frac{7}{12} \quad 11 \cdot 27 \\
 \hline
 117 \cdot 39 \frac{7}{12} \quad 2110 \cdot 40 \\
 \hline
 723 \cdot 15 \\
 117 \cdot 39 \frac{7}{12} \\
 \hline
 173) 3657 \cdot 80 \frac{7}{12} \\
 12 \quad 12 \\
 \hline
 2076) 43893 \cdot 67 (21 \cdot 1433
 \end{array}$$

(40)

$$\begin{array}{r}
 2076) 491544 (236 \frac{102}{119} \\
 4152 \\
 \hline
 7634 \\
 6228 \\
 \hline
 14064 \\
 12456 \\
 \hline
 1608 \\
 \hline
 1608 = 403 \cdot \\
 2076 = 319 \cdot
 \end{array}$$

$$\begin{array}{r}
 4152 \\
 2373 \\
 2076 \\
 \hline
 297 \cdot 6 \\
 207 \cdot 6 \\
 \hline
 90 \cdot 00 \\
 83 \cdot 04 \\
 \hline
 6 \cdot 960 \\
 6 \cdot 228 \\
 \hline
 \cdot 7320 \\
 \cdot 6228 \\
 \hline
 \cdot 1092
 \end{array}$$

Page 127.

89·27
75·93
13·34

(3)	(4)	(5)	(6)
2)11368	2)2934	3)1011	2)1000
2)5684	3)1467	337	2)500
2)2842	3)489	3×337	2)250
7)1421	163		5)125
7)203	2×3 ² ×163		5)25
29			5
2 ³ ×7 ² ×29			2 ³ ×5 ³

1433

(7)	(8)	(9)	(10)
2)1024	2)32320	7)707	2)1118
2)512	2)16160	101	13)569
2)256	2)8080	7×101	43
2)128	2)4040		2×13×43
2)64	2)2020		
2)32	2)1010		
2)16	5)505		
2)8	101		
2)4	2 ⁶ ×5×101		
2			
2 ¹⁰			

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(3)
100=2²×5²

1..2..4
1..5..25
1..2..4..5..10..20..25..50..100

(4)

$$810 = 3^4 \times 2 \times 5$$

1..3..9..27..81

1..2

1..3..9..27..81..2..6..18..54..162

1..5

$$1..3..9..27..81..2..6..18..54..162..5..15..45..135..405..10..30..90..270..810 =$$

$$1..2..3..5..6..9..10..15..18..27..30..45..54..81..90..135..162..270..405..810.$$

(5)

$$920 = 2^3 \times 5 \times 23.$$

1..2..4..8

1..5

1..2..4..8..5..10..20..40

1..23

$$1..2..4..8..5..10..20..40..23..46..92..184..115..230..460..920 =$$

$$1..2..4..5..8..10..20..23..40..46..92..115..184..230..460..920.$$

(6)

$$25000 = 5^5 \times 2^3$$

1..5..25..125..625..3125

1..2..4..8

$$1..5..25..125..625..3125..2..10..50..250..1250..6250..4..20..100..500..2500..12500..8..40..200..1000..5000..25000 =$$

$$1..2..4..5..8..10..20..25..40..50..100..125..200..250..500..625..1000..1250..2500..3125..5000..6250..12500..25000.$$

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(2)

$$88200 = 2^3 \times 3^2 \times 5^2 \times 7^2$$

$$3+1=4$$

$$2+1=3$$

$$2+1=3$$

$$2+1=3$$

$$4 \times 3 \times 2 \times 3 = 108$$

(3)

$$3500 = 2^2 \times 5^3 \times 7$$

$$2+1=3$$

$$3+1=4$$

$$1+1=2$$

$$3 \times 4 \times 2 = 24$$

21=

18=

27=

36=

3 is com

(4)

$$6336=2^6 \times 3^2 \times 11$$

$$6+1=7$$

$$2+1=3$$

$$1+1=2$$

$$7 \times 3 \times 2=42$$

135..405..

1..90..135..

(6)

$$49000=2^3 \times 5^3 \times 7^2$$

$$3+1=4$$

$$3+1=4$$

$$2+1=3$$

$$4 \times 4 \times 3=48$$

460..920 =

0..460..920.

(8)

$$75600=2^4 \times 3^3 \times 5^2 \times 7$$

$$4+1=5$$

$$3+1=4$$

$$2+1=3$$

$$1+1=2$$

$$5 \times 4 \times 3 \times 2=120$$

4..20..100..

25000 =

0..500..625..

00.

(5)

$$824=2^3 \times 103$$

$$3+1=4$$

$$1+1=2$$

$$4 \times 2=8$$

(7)

$$81000=2^3 \times 3^4 \times 5^3$$

$$3+1=4$$

$$4+1=5$$

$$3+1=4$$

$$4 \times 5 \times 4=80$$

(9)

$$256000=2^{10} \times 5^3$$

$$10+1=11$$

$$2+1=3$$

$$11 \times 3=33$$

Page 129.

(2)

$$21=7 \times 3$$

$$18=2 \times 3 \times 3$$

$$27=3 \times 3 \times 3$$

$$36=4 \times 3 \times 3$$

(3)

$$21=3 \times 7$$

$$77=11 \times 7$$

$$42=2 \times 3 \times 7$$

$$35=5 \times 7$$

(4)

$$26=2 \times 13$$

$$52=2 \times 2 \times 13$$

$$91=7 \times 13$$

$$143=11 \times 13$$

3 is common to all. 7 is common to all. 13 is common to all.

(5)

$$82=41 \times 2$$

$$118=59 \times 2$$

$$146=73 \times 2$$

2 is common to all.

3 \times 7

24

Page 130.

(2)	(3)	(4)
296)407(1	308)508(1	74)84(1
<u>296</u>	<u>308</u>	<u>74</u>
111)296(2	198)308(1	10)74(7
<u>222</u>	<u>198</u>	<u>70</u>
74)111(1	110)198(1	4)10(2
<u>74</u>	<u>110</u>	<u>8</u>
37)74(2	88)110(1	2)4
<u>74</u>	<u>88</u>	<u>2</u>
G. C. M. = 37.	22)88(4	G. C. M. = 2.
	<u>88</u>	
	G. C. M. = 22.	

(5)	(6)
1825)2555(1	556)672(1
<u>1825</u>	<u>556</u>
730)1825(2	116)556(4
<u>1460</u>	<u>464</u>
365)730(2	92)116(1
<u>730</u>	<u>92</u>
G. C. M. = 365.	24)92(3
	<u>72</u>
	20)24(1
	<u>20</u>
	4)20
	<u>20</u>
	5
	G. C. M. = 4.

Theref
(1
468)92
468
45

375 is
and the

Th

Page 131.

$$\begin{array}{r}
 (9) \\
 110)140(1 \\
 \underline{110} \\
 30)110(3 \\
 \underline{90} \\
 20)30(1 \\
 \underline{20} \\
 10)680 \quad 10)20 \\
 \underline{68} \quad \underline{2}
 \end{array}$$

$$\begin{array}{r}
 (10) \\
 1326)3094(2 \\
 \underline{2652} \\
 442)1326(3 \\
 \underline{1326}
 \end{array}$$

Also 4420 is divisible by 442 ;
therefore it is their G. C. M.

Therefore 10 is their G. C. M.

$$\begin{array}{r}
 (11) \\
 468)922(1 \\
 \underline{468} \\
 454)468(1 \\
 \underline{454} \\
 14)454(32 \\
 \underline{42} \\
 34 \\
 \underline{28} \\
 6)14(2 \\
 \underline{12} \\
 2)6 \\
 \underline{6} \\
 3
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 204)1190(5 \\
 \underline{1020} \\
 170)204(1 \\
 \underline{170} \\
 34)170(5 \\
 \underline{170} \\
 17)2006(118 \\
 \underline{17} \\
 30 \\
 \underline{17} \\
 136 \\
 \underline{136}
 \end{array}$$

G. C. M.=17.

375 is not divisible by 2,
and therefore their G. C. M. is 1.

Page 132.

(15)

$$\begin{array}{l}
 56=2^3 \times 7 \\
 84=2^2 \times 3 \times 7 \\
 140=2^2 \times 5 \times 7 \\
 168=2^3 \times 3 \times 7
 \end{array}$$

The greatest factors which are common are 2^2 and 7;
therefore the G. C. M.= $2^2 \times 7=28$.

(16)

$$241920 = 2^8 \times 3^3 \times 5 \times 7$$

$$380160 = 2^8 \times 3^3 \times 5 \times 11$$

$$69120 = 2^9 \times 3^3 \times 5$$

$$103680 = 2^8 \times 3^4 \times 5$$

The greatest factors which are common are 2^8 , 3^3 and 5 ;
therefore the G. C. M. $= 2^8 \times 3^3 \times 5 = 34560$.

(17)

$$10800 = 2^4 \times 3^3 \times 5^2$$

$$28040 = 2^3 \times 5 \times 701$$

$$2160 = 2^4 \times 3^3 \times 5$$

The greatest factors which are common are 2^3 and 5 ;
therefore the G. C. M. $= 2^3 \times 5 = 40$.

Page 133.

(2)

$$6 = 2 \times 3$$

$$7 = 7$$

$$42 = 2 \times 3 \times 7$$

$$9 = 3^2$$

$$10 = 2 \times 5$$

$$630 = 2 \times 3^2 \times 5 \times 7$$

$$2 \times 3^2 \times 5 \times 7 = 630.$$

(3)

$$1 = 1$$

$$2 = 2$$

$$3 = 3$$

$$4 = 2^2$$

$$5 = 5$$

$$6 = 2 \times 3$$

$$7 = 7$$

$$8 = 2^3$$

$$9 = 3^2$$

$$3^2 \times 2^3 \times 5 \times 7 = 2520.$$

(4)

$$6 = 2 \times 3$$

$$9 = 3^2$$

$$12 = 2^2 \times 3$$

$$15 = 3 \times 5$$

$$18 = 2 \times 3^2$$

$$21 = 3 \times 7$$

$$30 = 2 \times 3 \times 5$$

$$2^2 \times 3^2 \times 5 \times 7 = 1260.$$

(5)

$$670 = 2 \times 5 \times 67$$

$$100 = 2^2 \times 5^2$$

$$335 = 5 \times 67$$

$$25 = 5^2$$

$$2^2 \times 5^2 \times 67 = 6700.$$

(6)

$$8 = 2^3$$

$$10 = 2 \times 5$$

$$18 = 2 \times 3^2$$

$$27 = 3^3$$

$$36 = 2^2 \times 3^2$$

$$44 = 2^2 \times 11$$

$$396 = 2^2 \times 3^2 \times 11$$

$$2^3 \times 3^3 \times 5 \times 11 = 11880.$$

(9)

(10)

(11)

$$2)12..10..24 \quad 2)14..21..3..2..63 \quad 2)18..12..39..216..234$$

$$2)6..5..12 \quad 3)7..21..3..1..63 \quad 2)9..6..39..108..117$$

$$3)3..5..6 \quad 7)7..7..1..1..21 \quad 3)9..3..39..54..117$$

$$1..5..2 \quad 1..1..1..1..3 \quad 3)3..1..13..18..39$$

$$2 \times 2 \times 3 \times 5 \times 2 = 120 \quad 2 \times 3 \times 7 \times 3 = 126 \quad 13)1..1..13..6..13$$

$$1..1..1..6..1$$

$$2 \times 2 \times 3 \times 3 \times 13 \times 6 = 2808$$

(12)

(13)

$$2)3..18..15..20..70$$

$$2)24..16..18..20$$

$$2)4..9..15..10..35$$

$$2)12..8..9..10$$

$$3)2..9..15..5..35$$

$$2)6..4..9..5$$

$$5)2..3..5..5..35$$

$$3)3..2..9..5$$

$$2..3..1..1..7$$

$$1..2..3..5$$

$$2 \times 2 \times 3 \times 5 \times 2 \times 3 \times 7 = 2520.$$

$$2 \times 2 \times 2 \times 3 \times 2 \times 3 \times 5 = 720.$$

(14)

(15)

$$2)60..50..144..35..18$$

$$2)27..54..81..14..63$$

$$2)30..25..72..35..9$$

$$3)27..27..81..7..63$$

$$3)15..25..36..35..9$$

$$3)9..9..27..7..21$$

$$3)5..25..12..35..3$$

$$3)3..3..9..7..7$$

$$5)5..25..4..35..1$$

$$7)1..1..3..7..7$$

$$1..5..4..7..1$$

$$1..1..3..1..1$$

$$2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 4 \times 7 = 25200.$$

$$2 \times 3 \times 3 \times 3 \times 7 \times 3 = 1134.$$

(19)

(20)

$$300 \overline{) 300..200..150..80..75..125}$$

$$165 \overline{) 20..60..15..15..210..63..27}$$

$$10 \overline{) 2} \quad 5$$

$$21 \overline{) 4..4} \quad 14..21..9$$

$$12 \overline{) 4..4} \quad 2 \quad 8$$

$$300 \times 10 = 3000.$$

$$165 \times 21 \times 12 = 41580.$$

(21)

$$\begin{array}{r|l}
 144 & 12 \dots 132 \dots 144 \dots 60 \dots 96 \dots 1728 \\
 12 & 11 \qquad \qquad \qquad 5 \quad 2 \quad 12 \\
 55 & 11 \qquad \qquad \qquad 5 \\
 \hline
 & 144 \times 12 \times 55 = 95040.
 \end{array}$$

Page 138.

(3)	(4)	(5)	(6)
12)592835	5)3700	11)10000	6)1000000
12)49402..e	5)740..0	11)909..1	6)166666..4
12)4116..t	5)148..0	11)82..7	6)27777..4
12)343..0	5)29..3	7..5	6)4629..3
12)28..7	5)5..4	7571.	6)771..3
2..4	1..0		6)128..3
2470te.	104300.		6)21..2

3..3
33233344.

(7)	(8)	(9)	(10)
8)10000	12)12345654321	9)10000	2)300
8)1250..0	12)1028804526..9	9)1111..1	2)150..0
8)156..2	12)85733710..6	9)123..4	2)75..0
8)19..4	12)7144475..t	9)13..6	2)37..1
2..3	12)595372..e	1..4	2)18..1
23420.	12)49614..4	14641.	2)9..0
	12)4134..6		2)4..1
	12)344..6		2)2..0
	12)28..8		1..0
	2..4		
	248664et69.		

100101100

35261

(14)	(15)	(16)
IX	V	IV
8)37704	7)444	9)1212201
8)4311..5	7)32..5	9)23121..0
8)480..1	2..3	9)1101..0
8)54..4	235.	9)21..0
8..1	1..4	1..0
61415.	1465.	10000.
(19)	(20)	(21)
IV	III	IX
20212331	101202220	1522365
4	3	9
8	3	14
4	3	9
34	10	128
4	3	9
137	32	1154
4	3	9
550	96	10389
4	3	9
2203	290	93507
4	3	9
8815	872	841568
4	3	166666
35261	2618	6
	3	1000000
	7854	

(24)

$$\begin{array}{r}
 \text{IX} \\
 3)132713 \\
 \hline
 3)40834..0 \\
 \hline
 3)13271..1 \\
 \hline
 3)4083..1 \\
 \hline
 3)1327..0 \\
 \hline
 3)408..1 \\
 \hline
 3)132..2 \\
 \hline
 3)40..2 \\
 \hline
 3)13..0 \\
 \hline
 3)4..0 \\
 \hline
 1..1
 \end{array}$$

$$\begin{array}{r}
 \text{IX} \\
 12)132713 \\
 \hline
 12)10207..9 \\
 \hline
 12)682..t \\
 \hline
 12)51..8 \\
 \hline
 3..t
 \end{array}$$

$$\begin{array}{r}
 \text{IX} \\
 8)132713 \\
 \hline
 8)14757..1 \\
 \hline
 8)1652..0 \\
 \hline
 8)184..6 \\
 \hline
 8)21..5 \\
 \hline
 2..3
 \end{array}$$

IX	III	XII	VIII
132713 =	11002210110 =	37879 =	235601
9	3	12	8
<hr/>	<hr/>	<hr/>	<hr/>
12	4 332	46	19
9	3 3	12	8
<hr/>	<hr/>	<hr/>	<hr/>
110	12 997	560	157
9	3 3	12	8
<hr/>	<hr/>	<hr/>	<hr/>
997	36 2991	6730	1262
9	3 3	12	8
<hr/>	<hr/>	<hr/>	<hr/>
8974	110 8974	80769 den.	10096
9	3 3		8
<hr/>	<hr/>	<hr/>	<hr/>
80769 denary.	332 26923		80769 denary.
	3		
	<hr/>		
	80769 denary.		

(25)

3
7..1
2..0
4..6
1..5
2..3

VIII
235601
8
19
8
157
8
262
8
996
8
769 denary.

XII	XII	XII	XII
9) <u>t2t290</u>	6) <u>t2t290</u>	4) <u>t2t290</u>	2) <u>t2t290</u>
9) <u>117978..0</u>	6) <u>135856..0</u>	4) <u>268683..0</u>	2) <u>515146..0</u>
9) <u>1624t..2</u>	6) <u>34e4e..0</u>	4) <u>78180..3</u>	2) <u>268683..0</u>
9) <u>2032..4</u>	6) <u>69t9..5</u>	4) <u>1e050..0</u>	2) <u>134341..1</u>
9) <u>284..2</u>	6) <u>1179..3</u>	4) <u>5913..0</u>	2) <u>78180..1</u>
9) <u>37..1</u>	6) <u>233..3</u>	4) <u>1533..3</u>	2) <u>3t0t0..0</u>
4..7	6) <u>46..3</u>	4) <u>439..3</u>	2) <u>1e050..0</u>
	6) <u>9..0</u>	4) <u>10e..1</u>	2) <u>e626..0</u>
	1..3	4) <u>32..3</u>	2) <u>5913..0</u>
		4) <u>9..2</u>	2) <u>2t67..1</u>
		2..1	2) <u>1533..1</u>
			2) <u>877..1</u>
			2) <u>439..1</u>
			2) <u>21t..1</u>
			2) <u>10e..0</u>
			2) <u>65..1</u>
			2) <u>32..1</u>
			2) <u>17..0</u>
			2) <u>9..1</u>
			2) <u>4..1</u>
			2) <u>2..0</u>
			1..0

(Continued on next page.)

(25 continued.)

XII	IX	VI	IV	II
$222290 = 4712420 = 130333500 = 21231330030 = 1001101101111100001100$				
12	9	6	4	2
122	43	9	9	2
12	9	6	4	2
1474	388	54	38	4
12	9	6	4	2
17690	3494	327	155	9
12	9	6	4	2
212289	31450	1965	621	19
12	9	6	4	2
2547468	283052	11793	2487	38
	9	6	4	2
2547468	70763	9951	77	39804
	6	4	2	2
	424578	39804	155	79608
	6	4	2	2
2547468	159216	310	159216	2
	4	2		
	636867	621	318433	
	4	2	2	
2547468 den.	1243	636867		
		2		
		1273734		
		2		
		2547468 den.		

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II
101111100001100

1243

2

2487

2

4975

2

9951

2

19902

2

39804

2

79608

2

159216

2

318433

2

636867

2

1273734

2

2547468 den.

(31)

VI

252

252

544

2224

544

122024

(35)

II

101

1001

1111

1011

1000

1111

10101

1010100

(32)

XII

62te)32e75721(62te

31556

161e7

1059t

58192

52512

58801

58801

(36)

VII

2143)142613(50·5254

14111

1503·0

1411·1

61·60

43·16

15·410

14·111

1·2660

1·1635

·1022

(39)

XII

34t7

6666

18536

18536

18536

18536

1t36e296

(33)

III

201210

102221

21212

(37)

VII

65432

43210

1444

65001

54321

326041

(40)

II

100101)1010100001(10010·111

100101

101000

100101

111

(34)

VIII

57264

675

354604

513354

434070

51117344

Page 146.

(45)						
4 ft.	7'	6"	10'''			
9	7	11	11			
<hr/>						
		4	2	11'''	3''''	2''''
	4	2	11	3	2	
2	8	4	11	10		
41	8	1	6			
<hr/>						
44	9	1	8	0	5	2

$$\begin{array}{r} (46) \\ 19 \text{ ft. } 10' \text{ } 3'' \\ 11 \quad 2 \quad 7 \\ \hline 3 \quad 3 \quad 8 \quad 11''' \quad 9''' \\ 218 \quad 4 \quad 9 \quad 6 \\ \hline 222 \quad 8 \quad 0 \quad 5 \quad 9 \end{array}$$

(47)

9''	7'''	4''''							
7	3	11'''''							
			8'''''	9'''''	8'''''	8'''''			
	2	4	10	0					
5	7	3	4						
5	10	4	11	8	8				

(48)

$9\frac{1}{4}$ in. = 9' 9"

9' 9"

5 7 4'''

3 3''' 0''''

5 8 3

4 0 9

4 6 8 6

					(49)
7 ft. 4'	11"				
3	2	2			
<hr style="border: 1px solid black;"/>					
	1	2	9'''	10''''	
1	2	9	10		
22	2	9			
<hr style="border: 1px solid black;"/>					
23	6	9	7	10	

$$\begin{array}{r} (51) \\ 15 \text{ ft.} \\ \begin{array}{r} 1 \quad 2' \\ \hline 2 \quad 6 \\ 15 \\ \hline 17 \quad 6 \\ \quad 8 \end{array} \end{array}$$
$$\begin{array}{r} (52) \\ \text{XII} \\ 45.6 \\ t.3 \\ \hline 1146 \\ 3870 \\ \hline 398.46 \\ 2 \end{array}$$

(53)
10 ft.
5
—
50 sq.ft.
7
—c'rds, c.ft.
128)350(2 94
256
—
94 cub.ft.

$$11\frac{1}{2} \text{ cub.ft.} = 11 \text{ cub.ft. } 152 \text{ cub.in. } \frac{2}{774 \cdot 90} \text{ cub.ft.} = 1096 \text{ 9'}$$

XII
774=1096 com. scale.

$$\begin{array}{r}
 (54) \\
 4 \text{ ft.} \\
 5\frac{1}{2} \\
 \hline
 20 \\
 1 \\
 \hline
 21 \text{ sq. ft.} \\
 70 \\
 \hline
 128)1470(11\frac{1}{4} \text{ cords} \\
 128 \\
 \hline
 190 \\
 128 \\
 \hline
 62 \\
 128 = 31. \\
 \hline
 3''' \text{ } 0'''' \\
 3
 \end{array}$$

$$\begin{array}{r}
 (55) \\
 \text{xx} \\
 4.78 \\
 9.6 \\
 \hline
 23 \text{ to} \\
 3590 \\
 \hline
 38.0 \text{ t} \\
 2. e \\
 \hline
 34492 \\
 7418 \\
 \hline
 \text{--- cub.ft.} \\
 18.652 = 128 \text{ } 6' \text{ } 5'' \text{ } 2''' \\
 18 \text{ duoden.} = 128 \text{ den.} \\
 \hline
 (56) \\
 25 \text{ ft.} = 300 \text{ in.} \\
 20 \text{ ''} = 240 \text{ ''} \\
 2 \text{ ft. } 6 \text{ in.} = 30 \text{ ''} \\
 \hline
 8 \\
 4 \\
 \hline
 32 \\
 2 \\
 \hline
 64 = 8 \times 8 \\
 300 \\
 240 \\
 \hline
 72000 \\
 30 \\
 \hline
 8)2160000 \\
 8)270000 \\
 \hline
 33750
 \end{array}$$

Page 149.

$$\begin{array}{r}
 (1) \\
 £93 \times 400 = \$372.00 \quad £276 \times 400 = \$1104.00 \\
 14 \text{ s.} \times 20 = 2.80 \quad 19 \text{ s.} \times 20 = 3.80 \\
 7\frac{1}{2} \text{ d.} = 30 \text{ f.} \times 5 \div 12 = .12\frac{1}{2} \quad 10\frac{1}{2} \text{ d.} = 42 \text{ f.} \times 5 \div 12 = .17\frac{1}{2} \\
 \hline
 £93 \text{ } 14 \text{ s. } 7\frac{1}{2} \text{ d.} = \$374.92\frac{1}{2} \quad £276 \text{ } 19 \text{ s. } 10\frac{1}{2} \text{ d.} = \$1107.97\frac{1}{2} \\
 £275 \times 400 = \$1100.00 \quad \$729.18 \\
 4 \text{ s.} \times 20 = .80 \quad 710.50 \\
 11\frac{1}{2} \text{ d.} = 47 \text{ f.} \times 5 \div 12 = .19\frac{7}{8} \quad 166.78 \\
 \hline
 £275 \text{ } 4 \text{ s. } 11\frac{1}{2} \text{ d.} = \$1100.99\frac{7}{8} \quad 374.92\frac{1}{2} \\
 \hline
 1107.97\frac{1}{2} \\
 497.81 \\
 1100.99\frac{7}{8} \\
 \hline
 \$4688.16\frac{7}{8}
 \end{array}$$

$$\begin{array}{r}
 (2) \\
 576 = 6 + 10 \times 7 + 10 \times 10 \times 5 \\
 \text{m. fur. per. yds. ft. in.} \quad \text{m. fur. per. yds. ft. in.} \\
 47 \text{ } 6 \text{ } 17 \text{ } 4 \text{ } 2 \text{ } 7 \times 6 = 286 \text{ } 6 \text{ } 27 \text{ } 1 \text{ } 2 \text{ } 0 \\
 \hline
 10 \\
 478 \text{ } 0 \text{ } 18 \text{ } 4 \text{ } 1 \text{ } 10 \times 7 = 3346 \text{ } 3 \text{ } 11 \text{ } 4 \text{ } 2 \text{ } 4 \\
 \hline
 10 \\
 4780 \text{ } 4 \text{ } 28 \text{ } 2 \text{ } 0 \text{ } 4 \times 5 = 23902 \text{ } 7 \text{ } 21 \text{ } 4 \text{ } 3 \text{ } 2 \\
 \hline
 27536 \text{ } 1 \text{ } 21 \text{ } 0 \text{ } 1 \text{ } 6
 \end{array}$$

(3)

$$243000 = 2^3 \times 3^5 \times 5^3$$

$$3+1=4$$

$$5+1=6$$

$$3+1=4$$

$$4 \times 6 \times 4 = 96$$

(4)

V

$$8) \overline{4234434}$$

$$8) \overline{241110..4}$$

$$8) \overline{13423..1}$$

$$8) \overline{1024..1}$$

$$8) \overline{32..3}$$

$$\overline{2..1}$$

VIII

$$5) \overline{713427}$$

$$5) \overline{133721..2}$$

$$5) \overline{22303..2}$$

$$5) \overline{3532..1}$$

$$5) \overline{570..2}$$

$$5) \overline{113..1}$$

$$5) \overline{17..0}$$

$$\overline{3..0}$$

VIII

$$\overline{713427}$$

$$\overline{213114}$$

$$\overline{500313}$$

V

$$\overline{30012122}$$

$$\overline{4234434}$$

$$\overline{20222133}$$

(5)

$$79 \cdot 342 \div 00006378 =$$

$$6378) 7934200000(1243994 \cdot 98275$$

$$\overline{6378}$$

$$\overline{15562}$$

$$\overline{12756}$$

$$\overline{28060}$$

$$\overline{25512}$$

$$\overline{25480}$$

$$\overline{19134}$$

$$\overline{63460}$$

$$\overline{57402}$$

$$\overline{60580}$$

$$\overline{57402}$$

$$\overline{31780}$$

$$\overline{25512}$$

$$\overline{6268 \cdot 0}$$

$$\overline{5740 \cdot 2}$$

$$\overline{527 \cdot 80}$$

$$\overline{510 \cdot 24}$$

$$\overline{17 \cdot 560}$$

$$\overline{12 \cdot 756}$$

$$\overline{4 \cdot 8040}$$

$$\overline{4 \cdot 4646}$$

$$\overline{\cdot 33940}$$

$$\overline{\cdot 31890}$$

$$\overline{\cdot 02050}$$

40

21

33

10

(7)

40	5.	7.	9.	11.	15.	18.	20.	21.	22.	24.	28.	30.	33.	35.	36.	40.	42.	44.	45.	48.	50.
21	7.	9.	11.	3.	3	21.	11.	3.	7.	3.	33.	7.	3	21.	11.	3.	3.	5.			
33	3	11	3			11.			11	3			11.	3.	2.	5.					
10																				2.	5.

$$40 \times 21 \times 33 \times 10 = 277200.$$

(9)

3378=

3994:98275

$$9999993000 = 10000000000 - 7000.$$

$$64276:3427 \times 10000000000 = 642763427000000$$

$$64276:3427 \times 7000 = 449934398:9$$

$$\underline{642762977065601:1}$$

(10)

IX

5) 78263

 5) 15230..3

 5) 2760..0

 5) 511..4

 5) 102..0

 5) 17..3

 3..1

IX

11) 78263

 11) 6430..3

 11) 526..6

 11) 43..0

 3..6

IX

7) 78263 =

 7) 11160..3

 7) 1407..5

 7) 177..3

 7) 23..4

 3..0

V

7) 3130403 =

 7) 214200..3

 7) 13220..5

 7) 1101..3

 7) 41..4

 3..0

XI

7) 36063

 7) 5640..3

 7) 884..5

 7) 128..3

 7) 14..4

 3..0

(2
243(1
162
81)162(2
162

(20)	(21)	(22)
XII	IV	VIII
713196)7te9-047(-011438	3333333	10000
7131-96	4	8
971-217	15	8
713-196	4	8
266-4110	63	64
245-3720	4	8
21-05300	255	512
19-3e846	4	8
3-862760	1023	4096
3-67e490	4	
113290	4095	
	4	
	16383	-

(23)

74002702 ÷ 144 = 513907 ft. 94 in.
 512907 ft. ÷ 9 = 57100 yards 7 ft.
 57100 yds. ÷ 30½ = 1887 per. 18½ yds.
 1887 per. 18 yds. 2 ft. 36 in.
 Add 7 ft. 94 in.
 40)1887 per. 19 yds. 0 ft. 130 in.
 4)47 r. 7 per. 19 yds. 0 ft. 130 in.
 11 a. 3 r. 7 per. 19 yds. 0 ft. 130 in.

(24)

1728 | 240..780..1280..1728
 65 | 5.. 65.. 15
 3 | 8
 1728 × 65 × 3 = 336960.

(25)

6 children will have 6 children's shares

4 women will have $4 \times 2 = 8$ " "3 men will have $3 \times 5 \times 2 = 30$ " "

3 men 4 w'n & 6 chi'n will have 44 children's sha.

44) \$7894.16

11) \$1973.54

 $\$179.41\frac{3}{4} =$ child's share. $\$179.41\frac{3}{4} \times 2 = \$358.82\frac{6}{8} =$ woman's share. $\$358.82\frac{6}{8} \times 5 = \$1794.12\frac{3}{4} =$ man's share.

(26)

(27)

11	11	yds. qrs. na. in.	yds. qrs. na. in.
1111111111	1000000000	7 1 1 1) 729 3 3 1	
2	2	4	4
—	—	—	—
3	2	29	2919
2	2	4	4
—	—	—	—
7	4	117	11679
2	2	24	24
—	—	—	—
15	8	235	23359
2	2	294	29194
—	—	—	—
31	16	2644	262784
2	2	4	4
—	—	—	—
63	32	1057)	105115 (99479 1067
2	2		9513
—	—	—	—
127	64		9985
2	2		9513
—	—	—	—
255	128		472
2	2		
—	—	—	—
511	256		
2	2		
—	—	—	—
1023	512		

1..2
1..7
1..2
1..1
1..2
1..2

(28)

762·4978

63·423

22874934

15249956

30499912

22874934

45749868

48359·8979694

(29)

723426

938·9126141

722487·0873859

(30)

lbs. oz. drs. scr.

129 0 0 0

63 4 7 2

65 7 0 1

(31)

$$1064 = 2^3 \times 7 \times 19.$$

1..2..4..8

1..7

1..2..4..8..7..14..28..56

1..19

1..2..4..8..7..14..28..56..19..38..76..152..133..266..532..1064 =

1..2..4..7..8..14..19..28..38..56..76..133..152..266..532..1064

(32)

30 ft. 6 in. = 366 in. 366

20 ft. 11 in. = 251 in. 251

2 ft. 7 in. = 31 in. —

366

1830

732

— in.

31)91866(2963 $\frac{1}{3}$

62

—

298

279

—

$$2963\frac{1}{3} \div 36 = 82\frac{5}{6} \text{ yds.}$$

196

186

—

106

93

—

13

qrs. na. in.

3 3 1

(99 $\frac{47}{106}$)

Page 158.

(30)

$$\frac{\frac{2}{5}, \frac{5}{7}, \frac{8}{9}, \frac{3}{5}, \frac{5}{8}}{5 \times 7 \times 9 \times 5 \times 18} = \frac{2 \times 7 \times 9 \times 5 \times 18}{5 \times 7 \times 9 \times 5 \times 18}, \frac{5 \times 5 \times 9 \times 5 \times 18}{5 \times 7 \times 9 \times 5 \times 18}, \frac{8 \times 5 \times 7 \times 5 \times 18}{5 \times 7 \times 9 \times 5 \times 18},$$

$$\frac{3 \times 5 \times 7 \times 9 \times 18}{5 \times 7 \times 9 \times 5 \times 18} = \frac{5 \times 5 \times 7 \times 9 \times 5}{11340}, \frac{21250}{25200}, \frac{17010}{7875}$$

$$\frac{5 \times 7 \times 9 \times 5 \times 18}{5 \times 7 \times 9 \times 5 \times 18} = \frac{28350}{28350}, \frac{28350}{28350}, \frac{28350}{28350}, \frac{28350}{28350}$$

(31)

$$\frac{\frac{8}{11}, \frac{12}{13}, \frac{5}{14}}{11 \times 13 \times 14} = \frac{8 \times 13 \times 14}{11 \times 13 \times 14}, \frac{12 \times 11 \times 14}{11 \times 13 \times 14}, \frac{5 \times 11 \times 13}{11 \times 13 \times 14} = \frac{1456}{2002}, \frac{1848}{2002}, \frac{715}{2002}$$

(32)

$$\frac{\frac{6}{7}, \frac{4}{11}, \frac{5}{13}, \frac{4}{7}, \frac{1}{2}}{7 \times 11 \times 13 \times 7 \times 2} = \frac{6 \times 11 \times 13 \times 7 \times 2}{7 \times 11 \times 13 \times 7 \times 2}, \frac{4 \times 7 \times 13 \times 7 \times 2}{7 \times 11 \times 13 \times 7 \times 2},$$

$$\frac{5 \times 7 \times 11 \times 7 \times 2}{7 \times 11 \times 13 \times 7 \times 2}, \frac{4 \times 7 \times 11 \times 13 \times 2}{7 \times 11 \times 13 \times 7 \times 2}, \frac{1 \times 7 \times 11 \times 13 \times 7}{7 \times 11 \times 13 \times 7 \times 2} =$$

$$\frac{12012}{14014}, \frac{5096}{14014}, \frac{5390}{14014}, \frac{8008}{14014}, \frac{7007}{14014}$$

(33)

$$\frac{\frac{6}{11}, \frac{4}{7}, \frac{8}{13}}{11 \times 7 \times 13} = \frac{6 \times 7 \times 13}{11 \times 7 \times 13}, \frac{4 \times 11 \times 13}{11 \times 7 \times 13}, \frac{8 \times 11 \times 7}{11 \times 7 \times 13} = \frac{546}{1001}, \frac{572}{1001}, \frac{616}{1001}$$

(34)

$$\frac{\frac{5}{6}, \frac{4}{7}, \frac{4}{5}, \frac{2}{11}}{6 \times 7 \times 5 \times 11} = \frac{5 \times 7 \times 5 \times 11}{6 \times 7 \times 5 \times 11}, \frac{4 \times 6 \times 5 \times 11}{6 \times 7 \times 5 \times 11}, \frac{4 \times 6 \times 7 \times 11}{6 \times 7 \times 5 \times 11},$$

$$\frac{2 \times 6 \times 7 \times 5}{6 \times 7 \times 5 \times 11} = \frac{1925}{2310}, \frac{1320}{2310}, \frac{1848}{2310}, \frac{420}{2310}$$

(35)

$$\frac{1}{2}, \frac{2}{3}, \frac{3}{4} = \frac{1 \times 3 \times 5 \times 7}{2 \times 3 \times 5 \times 7}, \frac{2 \times 2 \times 5 \times 7}{2 \times 3 \times 5 \times 7}, \frac{3 \times 2 \times 3 \times 7}{2 \times 3 \times 5 \times 7},$$

$$\frac{2 \times 2 \times 3 \times 5}{2 \times 3 \times 5 \times 7} = \frac{105}{210}, \frac{140}{210}, \frac{126}{210}, \frac{60}{210}.$$

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(38)

$$\frac{1}{5}, \frac{2}{8}, \frac{3}{6}, \frac{4}{4}, \frac{5}{15}.$$

The least common multiple of 5, 8, 6, 4, 15 is 120.

The multiplier for both terms of the first fraction is $\frac{120}{5} = 24$; for the second $\frac{120}{8} = 15$; for the third $\frac{120}{6} = 20$; for the fourth $\frac{120}{4} = 30$; for the fifth $\frac{120}{15} = 8$.

Multiplying by these numbers, we obtain $\frac{24}{120}, \frac{15}{120}, \frac{20}{120}, \frac{30}{120}$, and $\frac{8}{120}$.

(39)

$$\frac{1}{11}, \frac{2}{3}, \frac{3}{7}, \frac{4}{77}, \frac{5}{33}.$$

The least common multiple of 11, 3, 7, 77 and 33 is 231.

The multiplier for both terms of the first fraction is $\frac{231}{11} = 21$; for the second, $\frac{231}{3} = 77$; for the third, $\frac{231}{7} = 33$; for the fourth, $\frac{231}{77} = 3$; and for the fifth, $\frac{231}{33} = 7$.

Multiplying by these numbers, we obtain $\frac{21}{231}, \frac{77}{231}, \frac{33}{231}, \frac{3}{231}$, and $\frac{7}{231}$.

(40)

$$\frac{1}{2}, \frac{2}{3}, \frac{3}{6}, \frac{4}{7}, \frac{5}{10}, \frac{6}{12}, \frac{7}{16}, \frac{8}{37}.$$

The least common multiple of 2, 3, 5, 6, 8, 10, 15, 16 and 80 is 240.

The multiplier for both terms of the first fraction is $\frac{240}{2} = 120$; for the second, $\frac{240}{3} = 80$; for the third, $\frac{240}{6} = 40$; for the fourth, $\frac{240}{7} = 34 \frac{2}{7}$; for the fifth, $\frac{240}{10} = 24$; for the sixth, $\frac{240}{12} = 20$; for the seventh, $\frac{240}{16} = 15$; for the eighth, $\frac{240}{37} = 6 \frac{18}{37}$; and for the ninth, $\frac{240}{80} = 3$.

Multiplying by these numbers, we obtain $\frac{120}{240}, \frac{80}{240}, \frac{40}{240}, \frac{34 \frac{2}{7}}{240}, \frac{24}{240}, \frac{20}{240}, \frac{15}{240}, \frac{6 \frac{18}{37}}{240}$, and $\frac{3}{240}$.

(41)

$$\frac{3}{5}, \frac{7}{10}, \frac{2}{3}, \frac{11}{30}, \frac{13}{45}, \frac{23}{60}.$$

The least common multiple of 5, 10, 25, 30, 45, and 60 is 900.

The multiplier for both terms of the first fraction is $\frac{900}{5} = 180$; for the second, $\frac{900}{10} = 90$; for the third, $\frac{900}{25} = 36$; for the fourth, $\frac{900}{30} = 30$; for the fifth, $\frac{900}{45} = 20$; and for the sixth, $\frac{900}{60} = 15$.

Multiplying by these numbers, we obtain $\frac{540}{900}, \frac{630}{900}, \frac{216}{900}, \frac{390}{900}, \frac{380}{900},$ and $\frac{345}{900}.$

(42)

$$\frac{1}{20}, \frac{7}{30}, \frac{11}{40}, \frac{1}{50}.$$

The least common multiple of 20, 30, 40, and 50 is 600.

The multiplier for both terms of the first fraction is $\frac{600}{20} = 30$; for the second, $\frac{600}{30} = 20$; for the third, $\frac{600}{40} = 15$; and for the fourth, $\frac{600}{50} = 12$.

Multiplying by these numbers, we obtain $\frac{30}{600}, \frac{140}{600}, \frac{165}{600}$ and $\frac{12}{600}.$

(43)

$$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{11}{12}, \frac{13}{16}, \frac{23}{24}.$$

The least common multiple of 2, 3, 4, 6, 8, 12, 16, and 24 is 48.

The multiplier for both terms of the first fraction is $\frac{48}{2} = 24$; for the second, $\frac{48}{3} = 16$; for the third, $\frac{48}{4} = 12$; for the fourth, $\frac{48}{6} = 8$; for the fifth, $\frac{48}{8} = 6$; for the sixth, $\frac{48}{12} = 4$; for the seventh, $\frac{48}{16} = 3$; and for the eighth, $\frac{48}{24} = 2$.

Multiplying by these numbers, we obtain $\frac{24}{48}, \frac{32}{48}, \frac{35}{48}, \frac{42}{48}, \frac{44}{48}, \frac{52}{48},$ and $\frac{46}{48}.$

(44)

$$\frac{5}{7}, \frac{11}{12}, \frac{1}{15}, \frac{2}{27}, \frac{3}{35}, \frac{1}{40}.$$

The least common multiple of 7, 12, 15, 27, 35 and 40 is 7560.

The multiplier for both terms of the first fraction is $\frac{7560}{5} = 1512$; for the second, $\frac{7560}{12} = 630$; for the third, $\frac{7560}{15} = 504$; for the fourth, $\frac{7560}{27} = 280$; for the fifth, $\frac{7560}{35} = 216$; for the sixth, $\frac{7560}{40} = 189$.

Multiplying by these numbers, we obtain $\frac{7560}{7560}, \frac{72720}{7560}, \frac{10080}{7560}, \frac{220440}{7560}, \frac{47520}{7560},$ and $\frac{143652}{7560}.$

(45)

$\frac{1}{15}, \frac{1}{8}, \frac{1}{3}, \frac{1}{12}, \frac{1}{11}, \frac{1}{7}, \frac{1}{20}, \frac{1}{35}$.

The least common multiple of 15, 8, 3, 12, 11, 20, 7, and 35 is 9240.

The multiplier for both terms of the first fraction is $\frac{9240}{15} = 616$; for the second, $\frac{9240}{8} = 1155$; for the third, $\frac{9240}{3} = 3080$; for the fourth, $\frac{9240}{12} = 770$; for the fifth, $\frac{9240}{11} = 840$; for the sixth, $\frac{9240}{20} = 462$; for the seventh, $\frac{9240}{7} = 1320$; for the eighth, $\frac{9240}{35} = 264$.

Multiplying by these numbers, we obtain $\frac{8816}{9240}, \frac{8085}{9240}, \frac{13320}{9240}, \frac{8170}{9240}, \frac{8040}{9240}, \frac{8778}{9240}, \frac{7840}{9240}$, and $\frac{7648}{9240}$.

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(47)

$$\frac{1}{4} \text{ of } \frac{1}{3} \text{ of } \frac{1}{11} \text{ of } \frac{1}{2} = \frac{4 \times 3 \times 6 \times 35}{7 \times 5 \times 11 \times 72} = \frac{2520}{27720} = \frac{1}{11}.$$

(48)

$$\frac{2}{3} \text{ of } \frac{1}{4} \text{ of } \frac{1}{7} \text{ of } \frac{81}{100} \text{ of } \frac{25}{11} = \frac{2 \times 4 \times 6 \times 81 \times 25}{3 \times 9 \times 7 \times 100 \times 24} = \frac{97200}{453600} = \frac{1}{4}.$$

(49)

$$\frac{3}{8} \text{ of } \frac{1}{11} \text{ of } \frac{1}{7} = \frac{21 \times 6 \times 77}{35 \times 11 \times 36} = \frac{1}{7}.$$

(50)

$$\frac{2}{3} \text{ of } \frac{1}{4} \text{ of } \frac{1}{11} \text{ of } \frac{1}{7} = \frac{2 \times 4 \times 3 \times 13}{5 \times 7 \times 11 \times 17} = \frac{813}{6545}.$$

Page 161.

(53)

$$\frac{2}{3} \text{ of } \frac{4}{7} \text{ of } \frac{3}{5} \text{ of } \frac{1}{2} = \frac{5 \times 6 \times 2 \times 3}{9 \times 7 \times 3 \times 16} = \frac{5 \times \overset{2}{\cancel{6}} \times \overset{2}{\cancel{2}} \times \overset{3}{\cancel{3}}}{\underset{1}{9} \times 7 \times \underset{3}{\cancel{3}} \times \underset{8}{16}} = \frac{5}{3 \times 7 \times 4} = \frac{5}{84}.$$

(54)

$$\frac{2}{3} \text{ of } \frac{4}{7} \text{ of } \frac{1}{12} \text{ of } \frac{1}{11} \text{ of } \frac{1}{13} \text{ of } \frac{1}{17} = \frac{2 \times 5 \times 18 \times 6 \times 11 \times 13}{3 \times 9 \times 132 \times 11 \times 13 \times 17} =$$

$$\frac{2 \times 5 \times \overset{2}{\cancel{18}} \times \overset{2}{\cancel{6}} \times 11 \times 13}{\underset{33}{9} \times \underset{1}{9} \times \underset{11}{132} \times 11 \times 13 \times 17} = \frac{2 \times 5}{33 \times 17} = \frac{10}{561}.$$

(55)

$$\frac{2}{3} \text{ of } \frac{4}{7} \text{ of } 5\frac{1}{2} = \frac{2 \times 4 \times 11}{7 \times 11 \times 2} = \frac{2 \times 4 \times 11}{7 \times 11 \times \underset{2}{\cancel{2}}} = 4.$$

(56)

$$\frac{1}{9} \text{ of } \frac{2}{13} \text{ of } \frac{11}{200} \text{ of } \frac{5}{169} \text{ of } \frac{1}{17} \text{ of } \frac{1}{13} = \frac{1 \times 8 \times 117 \times 50 \times 13 \times 13}{9 \times 13 \times 200 \times 169 \times 17 \times 6} =$$

$$\frac{1 \times \overset{2}{\cancel{8}} \times \overset{9}{\cancel{117}} \times \overset{5}{\cancel{50}} \times \overset{13}{\cancel{13}} \times \overset{13}{\cancel{13}}}{\underset{4}{9} \times \underset{13}{13} \times \underset{18}{200} \times \underset{3}{169} \times 17 \times 6} = \frac{1}{17 \times 3} = \frac{1}{51}.$$

(57)

$$\frac{1}{11} \text{ of } \frac{1}{7} \text{ of } \frac{9}{19} \text{ of } \frac{2}{17} \text{ of } \frac{3}{11} \text{ of } \frac{4}{7} = \frac{3 \times 4 \times 9 \times 33 \times 38 \times 47}{11 \times 7 \times 19 \times 47 \times 72 \times 7} =$$

$$\frac{3 \times 4 \times \overset{3}{\cancel{9}} \times \overset{2}{\cancel{33}} \times \overset{2}{\cancel{38}} \times 47}{11 \times 7 \times \underset{18}{19} \times \underset{2}{47} \times \underset{18}{72} \times 7} = \frac{3 \times 3}{7 \times 7} = \frac{9}{49}.$$

(58)

$$\frac{1}{4} \text{ of } \frac{1}{11} \text{ of } 154 = \frac{4 \times 3 \times 154}{7 \times 11 \times 1} = \frac{4 \times 3 \times 154}{7 \times 11 \times 1} = \frac{2 \times 4 \times 3}{1} = 24.$$

Page 162.

(61)

$$\frac{14}{147} = \frac{14}{147} = \frac{14 \times 25}{45 \times 42} = \frac{14 \times 25}{45 \times 42} = \frac{5}{9 \times 3} = \frac{5}{27}.$$

(62)

$$\frac{11}{718} = \frac{11}{718} = \frac{11 \times 18}{12 \times 143} = \frac{11 \times 18}{12 \times 143} = \frac{3}{2 \times 13} = \frac{3}{26}.$$

(63)

$$\frac{153}{72} = \frac{153}{72} = \frac{78 \times 5}{5 \times 39} = \frac{78 \times 5}{5 \times 39} = 2.$$

(64)

$$\frac{113}{128}, \frac{34}{9}, \frac{7}{8} = \frac{34}{68}, \frac{13}{9}, \frac{7}{8} = \frac{35 \times 5}{3 \times 68}, \frac{13 \times 1}{9 \times 4}, \frac{2 \times 5}{7 \times 3} = \frac{175}{128}, \frac{13}{36}, \frac{10}{21}.$$

(65)

$$\frac{7}{153}, \frac{57}{126}, \frac{23}{34} = \frac{7}{27}, \frac{47}{16}, \frac{13}{24} = \frac{7 \times 4}{12 \times 68}, \frac{47 \times 13}{8 \times 3}, \frac{13 \times 7}{5 \times 24} = \frac{1}{3 \times 9}, \frac{47 \times 2}{3}, \frac{7}{5 \times 2} = \frac{1}{27}, \frac{31}{3}, \frac{17}{10}.$$

(66)

$$\frac{16\frac{3}{4}}{11\frac{3}{4}}, \frac{6\frac{1}{2}}{13}, \frac{17}{18\frac{1}{2}}, \frac{21\frac{3}{4}}{10\frac{3}{4}}, \frac{1}{4\frac{1}{2}} = \frac{5\frac{3}{4}}{3\frac{3}{4}}, \frac{3\frac{1}{2}}{1\frac{1}{2}}, \frac{17}{5\frac{1}{2}}, \frac{19\frac{1}{2}}{7\frac{3}{4}}, \frac{1}{2\frac{3}{4}} = \frac{10}{50 \times 8}, \frac{8}{8 \times 35 \times 7}$$

$$\frac{31 \times 1}{5 \times 13}, \frac{17 \times 3}{55 \times 1}, \frac{10\frac{3}{4} \times 7}{\frac{1}{2} \times 5}, \frac{1 \times 5}{2 \times 23} = \frac{10}{7}, \frac{31}{65}, \frac{51}{55}, \frac{21}{10}, \frac{5}{46} = 1\frac{7}{10}, 2\frac{1}{10}, 2\frac{1}{10}, 2\frac{1}{10}, 2\frac{1}{10}$$

Page 163.

(68)

$$\frac{4}{5} \text{ of } \frac{1}{18\frac{1}{4}} = \frac{1}{20} \text{ of a lb.}$$

(70)

$$\frac{2}{8} \text{ of } \frac{8}{7} \text{ of } \frac{1}{12\frac{1}{6}} \text{ of } \frac{1}{20} = \frac{1}{7 \times 6 \times 20} = \frac{1}{840}$$

(71)

$$\frac{2}{9} \text{ of } \frac{5}{25} \text{ of } \frac{1}{\frac{1}{2}} = \frac{5}{9 \times 2} = \frac{5}{18} \text{ wk.}$$

(72)

$$\frac{5}{11} \text{ of } \frac{81}{5} \text{ of } \frac{4}{4} \text{ of } \frac{1}{5} = \frac{81}{11 \times 4 \times 5} = \frac{81}{220} \text{ Eng. Ell.}$$

(73)

$$\frac{3}{7} \text{ of } \frac{4}{11} \text{ of } \frac{1}{5\frac{1}{2}} = \frac{3}{7} \text{ of } \frac{4}{11} \text{ of } \frac{2}{11} = \frac{24}{825} \text{ per.}$$

$$= \frac{10}{50 \times 3} \div \frac{3 \times 35}{7}$$

$$(74) \quad \frac{2}{3} \text{ of } \frac{4}{7} \text{ of } 21 \frac{1}{14} \text{ of } \frac{1}{8} = \frac{2 \times 4 \times 295 \times 1}{3 \times 7 \times 14 \times 8} = \frac{295}{294} = 1 \frac{1}{294} \text{ c.}$$

$$\frac{31}{25}, \frac{11}{25}, 2 \frac{1}{10}, \frac{5}{16}$$

$$(75) \quad \frac{3}{19} \text{ of } \frac{4}{17} \text{ of } 9 \text{ of } \frac{1}{2} \text{ of } \frac{1}{40} \text{ of } \frac{1}{4} = \frac{3 \times 4 \times 18 \times 1 \times 1}{19 \times 17 \times 2 \times 40 \times 4} = \frac{3}{17 \times 2 \times 40} = \frac{3}{1360} \text{ a.}$$

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(78)

$$\frac{14}{79} \text{ of } \frac{4}{1} \text{ of } \frac{2}{1} \text{ of } \frac{4}{1} = \frac{448}{79} \text{ qt.}$$

(79)

$$\frac{2}{9} \text{ of } \frac{4}{1} \times \frac{2}{1} \times \frac{4}{1} \times \frac{5}{1} \times \frac{3}{2} = \frac{2 \times 4 \times 4 \times 5}{3} = \frac{160}{3}$$

(80)

$$\frac{7}{8} \times \frac{2}{1} \times \frac{2}{1} \times \frac{4}{1} \times \frac{2}{1} \times \frac{2}{1} \times \frac{3}{2} = \frac{7 \times 2 \times 2 \times 4 \times 2}{3} = \frac{224}{3}$$

(81)

$$\frac{17}{22} \times \frac{12}{11} \times \frac{8}{1} \times \frac{3}{1} = \frac{17 \times 6 \times 8 \times 3}{11} = \frac{2448}{11} \text{ scr.}$$

(82)

$$\frac{1}{5000} \times \frac{2}{3} \times \frac{3}{4} \times \frac{6}{11} \times \frac{2}{7} \times \frac{2}{1} \times \frac{4}{1} = \frac{2 \times 6 \times 2 \times 2 \times 4}{625 \times 7} = \frac{128}{4375} \text{ dr.}$$

(84)

$$\begin{array}{r}
 \text{bush. pk. gal. qt. pt.} \\
 11) 3 \quad 0 \quad 0 \quad 0 \quad 0 \\
 \hline
 1 \quad 0 \quad 0 \quad 1 \frac{5}{11}
 \end{array}$$

$$\begin{array}{r}
 \text{lbs. oz. dr.} \\
 7) 6 \quad 0 \quad 0 \\
 \hline
 13 \quad 11 \frac{3}{4}
 \end{array}$$

(85)

$$\begin{array}{r}
 \text{yds. qr. na. in.} \\
 13) 7 \quad (2 \quad 0 \quad 1 \frac{5}{13}) \\
 \hline
 4 \\
 \hline
 28 \text{ qrs.} \\
 \hline
 26 \\
 \hline
 2 \\
 \hline
 4 \\
 \hline
 8 \text{ na.} \\
 \hline
 2 \frac{1}{2} \\
 \hline
 18 \\
 \hline
 13 \\
 \hline
 5
 \end{array}$$

(87)

$$\begin{array}{r}
 \text{fur. per. yds. ft. in.} \\
 9) 8 \quad 0 \quad 0 \quad 0 \quad 0 \\
 \hline
 35 \quad 3 \quad 0 \quad 2
 \end{array}$$

$$\begin{array}{r}
 \text{£ s. d.} \\
 7) 4 \quad 0 \quad 0 \\
 \hline
 11 \quad 5 \frac{1}{2}
 \end{array}$$

(86)

$$\begin{array}{r}
 \text{lbs. oz. dwt. grs.} \\
 9) 8 \quad 0 \quad 0 \quad 0 \\
 \hline
 10 \quad 13 \quad 8
 \end{array}$$

$$\begin{array}{r}
 \text{sq. m. a. r. pr. yds. ft. in.} \\
 113) 11 \quad (62 \quad 1 \quad 8 \quad 4 \quad 2 \quad 79 \frac{1}{113}) \\
 \hline
 640 \\
 \hline
 7040 \text{ a.} \\
 \hline
 678
 \end{array}$$

260	484 yds.
226	452
34	32
4	9
136 r.	288 ft.
113	226
23	62
40	144
920 per.	248
904	248
16	62
30 $\frac{1}{2}$	8928 in.
480	791
4	1018
484 yds.	1017
	1

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(90)

6 bus. 1 pk. 1 gal. 1 qt. 1 pt. = 411 pts.

50 bush. = 3200 pts.

And the required fraction is $\frac{411}{3200}$.

(91)

35 per. 9 ft. 2 in. = 7040 in.

1 fur. = 7920 in.

The required fraction is $\frac{7040}{7920} = \frac{88}{99} = \frac{8}{9}$.

(92)

7 hrs. 12 min. = 432 min.

1 day = 1440 min.

Therefore the fraction is $\frac{432}{1440} = \frac{3}{10}$.

(93)

2 sq. yds. 2 ft. 120 in. = 3000 in.

3 sq. per. $13\frac{1}{2}$ yds. 1 ft. 72 in. = 135000 in.

And the fraction is $\frac{3000}{135000} = \frac{1}{45}$.

(94)

7 oz. 7 drs. 2 scr. 14 grs. = 3834 grs.

21 lbs. = 120960 grs.

The fraction is $\frac{3834}{120960} = \frac{119}{1440} = \frac{71}{900}$.

(95)

9 min. 48 sec. = 588 sec.

1 day = 86400 sec.

The required fraction is $\frac{588}{86400} = \frac{7}{1000}$.

(96)

16 bush. 1 pk. 1 pt. = 1041 pts.

69 bush. = 4416 pts.

Therefore the fraction is $\frac{1041}{4416} = \frac{347}{1472}$.

(97)

$$3 \text{ qrs. } 3\frac{1}{2} \text{ na.} = 15\frac{1}{2} = 1\frac{3}{2} \text{ na.}$$

$$1 \text{ Eng. ell} = 20 \text{ na.}$$

$$\text{And the fraction is } \frac{1\frac{3}{2}}{20} = \frac{1\frac{3}{2}}{20} = \frac{1}{10}.$$

(98)

$$13 \text{ dwt. } 7 \text{ grs.} = 319 \text{ grs.}$$

$$1 \text{ lb. Troy} = 5760 \text{ grs.}$$

$$\text{The required fraction is } \frac{319}{5760}.$$

(99)

$$4800 \text{ cub. ft.}$$

$$54 \text{ cords} = 6912 \text{ cub. ft.}$$

$$\text{Therefore the fraction is } \frac{4800}{6912} = \frac{40}{57} = \frac{4}{5} = \frac{4}{5}.$$

Page 167.

(6)

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{2}{3} = 2\frac{1}{3}.$$

(7)

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{24} + \frac{1}{48} = \frac{1}{2} = 3\frac{1}{2} = 3\frac{1}{2}.$$

(8)

$$4\frac{1}{2} + 11\frac{1}{2} + 16\frac{1}{2} + 21\frac{1}{2} + 19\frac{1}{2} = 4 + 11 + 16 + 21 + 19 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}) = 71 + \frac{1}{2} = 73\frac{1}{2}.$$

(9)

$$16\frac{1}{2} + 11\frac{1}{2} + 18\frac{1}{2} + 17\frac{1}{2} + 112\frac{1}{2} = 16 + 11 + 18 + 17 + 112 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}) = 174 + \frac{1}{2} = 174 + 3\frac{1}{2} = 177\frac{1}{2}.$$

(10)

$$4\frac{1}{2} + 1\frac{1}{2} + 7\frac{1}{2} = 4 + 1 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2}) = 5 + (\frac{3}{2} + \frac{1}{2}) = 5 + \frac{4}{2} = 6\frac{2}{2}.$$

(11)

$$\frac{1}{2} + \frac{2}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8}.$$

These fractions reduced to their least common denominator become $\frac{12520}{25040} + \frac{16640}{25040} + \frac{6260}{25040} + \frac{5008}{25040} + \frac{4160}{25040} + \frac{3584}{25040} + \frac{3120}{25040} = \frac{155520}{25040} = 6\frac{121}{25040}.$

1 +
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Thes
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35477.

Thes
nator b
148 =

16.1 +
3 + 3
16 +
17 + 3
1784 =
103 -

171 +
207 +
17 +
1 + 1
148 = 1
941 +

62 +
17 + (2
6 + 1
2 + 1
138 + 2
50 +

(12)

$\frac{1}{2} + \frac{2}{3} + \frac{1}{6}$ when reduced to their least common denominator become $\frac{3}{6} + \frac{4}{6} + \frac{1}{6} = \frac{8}{6} = 1\frac{2}{3}$.

(13)

$$\frac{1}{2} + \frac{2}{3} + \frac{1}{6} + \frac{1}{3} + \frac{1}{6}.$$

These fractions when reduced to their least common denominator become $\frac{3}{6} + \frac{4}{6} + \frac{1}{6} + \frac{2}{6} + \frac{1}{6} = \frac{11}{6} = 1\frac{5}{6}$.

(14)

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} + \frac{1}{3} + \frac{1}{6} + \frac{1}{6}.$$

These fractions when reduced to their least common denominator become $\frac{3}{6} + \frac{2}{6} + \frac{1}{6} + \frac{2}{6} + \frac{1}{6} + \frac{1}{6} = \frac{10}{6} = 1\frac{2}{3}$.

(15)

$$16\frac{3}{4} + 47\frac{2}{3} + 21\frac{1}{3} + 17\frac{1}{2} + 19\frac{1}{2} = 16 + 47 + 21 + 19 + (\frac{3}{4} + \frac{2}{3} + \frac{1}{3} + \frac{1}{2} + \frac{1}{2}).$$

$$16 + 47 + 21 + 19 = 103.$$

$$\frac{3}{4} + \frac{2}{3} + \frac{1}{3} + \frac{1}{2} + \frac{1}{2} = \frac{9}{12} + \frac{8}{12} + \frac{4}{12} + \frac{6}{12} + \frac{6}{12} = \frac{33}{12} = 2\frac{9}{12} = 2\frac{3}{4}.$$

$$103 + 2\frac{3}{4} = 105\frac{3}{4}.$$

(16)

$$17\frac{1}{2} + 43\frac{2}{3} + 168\frac{1}{3} + 207\frac{2}{3} + 506\frac{1}{2} = 17 + 43 + 168 + 207 + 506 + (\frac{1}{2} + \frac{2}{3} + \frac{1}{3} + \frac{2}{3} + \frac{1}{2}).$$

$$17 + 43 + 168 + 207 + 506 = 941.$$

$$\frac{1}{2} + \frac{2}{3} + \frac{1}{3} + \frac{2}{3} + \frac{1}{2} = \frac{6}{12} + \frac{8}{12} + \frac{4}{12} + \frac{8}{12} + \frac{6}{12} = \frac{32}{12} = 2\frac{8}{12} = 2\frac{2}{3}.$$

$$941 + 2\frac{2}{3} = 943\frac{2}{3}.$$

(17)

$$6\frac{1}{2} + 11\frac{1}{3} + 16\frac{2}{3} + 17\frac{1}{2} + 16\frac{1}{2} + 17\frac{1}{2} = 6 + 11 + 16 + 17 + 16 + 17 + (\frac{1}{2} + \frac{1}{3} + \frac{2}{3} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}).$$

$$6 + 11 + 16 + 17 = 50.$$

$$\frac{1}{2} + \frac{1}{3} + \frac{2}{3} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{6}{12} + \frac{4}{12} + \frac{8}{12} + \frac{6}{12} + \frac{6}{12} + \frac{6}{12} = \frac{36}{12} = 3.$$

$$50 + 3 = 53.$$

(18)

$$\frac{1}{8} + \frac{3}{8} + \frac{7}{8} + 68\frac{1}{8} = 68 + (\frac{1}{8} + \frac{3}{8} + \frac{7}{8} + \frac{1}{8}).$$

$$\frac{1}{8} + \frac{3}{8} + \frac{7}{8} + \frac{1}{8} = \frac{10}{8} + \frac{10}{8} + \frac{10}{8} + \frac{10}{8} = \frac{40}{8} = 5.$$

$$68 + 5 = 69\frac{1}{8}.$$

(19)

$$173\frac{3}{4} + 8\frac{1}{2} + 91\frac{1}{4} = 173 + 8 + 91 + (\frac{3}{4} + \frac{2}{4} + \frac{1}{4}).$$

$$173 + 8 + 91 = 272.$$

$$\frac{3}{4} + \frac{2}{4} + \frac{1}{4} = \frac{6}{4} + \frac{2}{4} + \frac{2}{4} = \frac{10}{4} = 2\frac{2}{4}.$$

$$272 + 2\frac{2}{4} = 273\frac{1}{2}.$$

(20)

$$1\frac{1}{8} + 2\frac{3}{8} + 3\frac{5}{8} + 4\frac{7}{8} = 1 + 2 + 3 + 4 + (\frac{1}{8} + \frac{3}{8} + \frac{5}{8} + \frac{7}{8}).$$

$$1 + 2 + 3 + 4 = 10.$$

$$\frac{1}{8} + \frac{3}{8} + \frac{5}{8} + \frac{7}{8} = \frac{16}{8} + \frac{24}{8} + \frac{40}{8} + \frac{56}{8} = \frac{136}{8} = 17.$$

$$10 + 17 = 27.$$

(21)

$$\frac{1}{10} + \frac{3}{10} + \frac{4}{10} + \frac{5}{10} + \frac{7}{10} + \frac{3}{10} + \frac{1}{10} + \frac{6}{10} = \frac{20}{10} + \frac{12}{10} + \frac{4}{10} + \frac{10}{10} + \frac{12}{10} + \frac{1}{10} + \frac{6}{10} = \frac{65}{10} = 6\frac{5}{10}.$$

(22)

$$7 + 11\frac{1}{2} + 18 + 26\frac{3}{4} + 79\frac{1}{4} = 7 + 11 + 18 + 26 + 79 + (\frac{1}{2} + \frac{3}{4} + \frac{1}{4}).$$

$$7 + 11 + 18 + 26 + 79 = 141.$$

$$\frac{1}{2} + \frac{3}{4} + \frac{1}{4} = \frac{2}{4} + \frac{3}{4} + \frac{1}{4} = \frac{6}{4} = 1\frac{2}{4}.$$

$$141 + 1\frac{2}{4} = 142\frac{1}{2}.$$

(23)

$$\frac{1}{3} \text{ of } \frac{2}{3} \text{ of } \frac{1}{2} = \frac{1}{9} = 3\frac{1}{3}. \quad \frac{3}{4} + 7\frac{1}{4} + 3\frac{3}{4} = 10 + (\frac{3}{4} + \frac{1}{4} + \frac{3}{4}).$$

$$\frac{3}{4} + \frac{1}{4} + \frac{3}{4} = \frac{10}{4} + \frac{2}{4} + \frac{6}{4} = \frac{18}{4} = 4\frac{2}{4}.$$

$$10 + 4\frac{2}{4} = 14\frac{1}{2}.$$

(24)

$$\frac{4\frac{1}{2}}{7\frac{6}{7}} = \frac{13\frac{1}{2}}{7\frac{6}{7}} = \frac{13 \times 18}{3 \times 7} = 11\frac{1}{7}.$$

$$\frac{1}{2} \text{ of } 1\frac{1}{2} \text{ of } 1\frac{1}{2} \text{ of } 1\frac{1}{2} = \frac{1 \times 36 \times 4 \times 11}{2 \times 11 \times 15 \times 4} = 1\frac{1}{2} = 1\frac{1}{2}.$$

$$\frac{20\frac{1}{2}}{7\frac{6}{7}} = \frac{83\frac{1}{2}}{4 \times 83} = 2\frac{1}{4}.$$

$$11\frac{1}{2} + 1\frac{1}{2} + 2\frac{1}{2} = 11 + 1 + 2 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2}) = 14 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2}).$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}.$$

$$14 + 1\frac{1}{2} = 15\frac{1}{2}.$$

(25)

$$3\frac{1}{2} + 11\frac{1}{2} + 14\frac{1}{2} = 3 + 11 + 14 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2}) = 28 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2}).$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}.$$

$$28 + 1\frac{1}{2} = 29\frac{1}{2}.$$

(26)

$$\frac{1}{2} \text{ of } 2 = 1, \frac{1}{3} \text{ of } 3 = 1, \frac{1}{4} \text{ of } 4 = 1, \frac{1}{5} \text{ of } 5 = 1, \frac{1}{6} \text{ of } 6 = 1, \frac{1}{7} \text{ of } 7 = 1, \frac{1}{8} \text{ of } 8 = 1, \frac{1}{9} \text{ of } 9 = 1, \frac{1}{10} \text{ of } 10 = 1.$$

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8} + \frac{1}{9} + \frac{1}{10} = \frac{630}{180} + \frac{420}{180} + \frac{315}{180} + \frac{252}{180} + \frac{210}{180} + \frac{180}{180} + \frac{157\frac{1}{2}}{180} + \frac{140}{180} + \frac{126}{180} = \frac{1800}{180} = 10.$$

(27)

$$41\frac{1}{2} + 105\frac{1}{2} + 300\frac{1}{2} + 241\frac{1}{2} + 472\frac{1}{2} = 41 + 105 + 300 + 241 + 472 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}).$$

$$41 + 105 + 300 + 241 + 472 = 1159.$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}.$$

$$1159 + 2\frac{1}{2} = 1161\frac{1}{2}.$$

(28)

$$92\frac{1}{4} + 37\frac{1}{4} + 7\frac{1}{4} = 92 + 37 + 7 + (\frac{1}{4} + \frac{1}{4} + \frac{1}{4}) = 136 + (\frac{1}{4} + \frac{1}{4} + \frac{1}{4}).$$

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4} = 0\frac{3}{4}.$$

$$136 + 0\frac{3}{4} = 136\frac{3}{4}.$$

(29)

$$\frac{10\frac{1}{2}}{2\frac{1}{2}} = \frac{4\frac{1}{2}}{1\frac{1}{2}} = \frac{53 \times 5}{5 \times 12} = 4\frac{1}{2} = 4\frac{1}{2}. \quad \frac{1}{2} \text{ of } \frac{1}{2} = \frac{1}{4}.$$

$$21\frac{1}{2} + 35\frac{1}{2} + 4\frac{1}{2} + \frac{1}{4} = 21 + 35 + 5 + (\frac{1}{2} + \frac{1}{4}) = 61\frac{1}{4}.$$

(30)

$$\frac{1}{4} \text{ of } \frac{1}{3} = \frac{1}{12} = 10\frac{1}{12}. \quad \frac{1}{8} \text{ of } \frac{3}{4} \text{ of } \frac{1}{2} = \frac{1}{16} = 15\frac{1}{16}.$$

$$\frac{1}{16} = 6\frac{1}{16}. \quad \frac{1}{3} \text{ of } \frac{1}{2} \text{ of } \frac{1}{4} \text{ of } \frac{1}{2} = \frac{1}{48} = 1\frac{1}{48}.$$

$$10\frac{1}{12} + 6\frac{1}{16} + 15\frac{1}{16} + 1\frac{1}{48} = 10 + 6 + 15 + 1 + (\frac{1}{12} + \frac{1}{16} + \frac{1}{16} + \frac{1}{48}).$$

$$\frac{1}{12} + \frac{1}{16} + \frac{1}{16} + \frac{1}{48} = \frac{4}{48} + \frac{3}{48} + \frac{3}{48} + \frac{1}{48} = \frac{11}{48} = 2\frac{1}{48}.$$

$$32 + 2\frac{1}{48} = 34\frac{1}{48}.$$

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(34)

	oz.	dr.	scr.	grs.
$\frac{1}{11}$ of a lb.	= 4	2	2	$14\frac{1}{11}$
$\frac{1}{7}$ of an oz.	=	3	1	$5\frac{1}{7}$
$\frac{1}{11}$ of a dr.	=		1	$1\frac{1}{11}$
$\frac{1}{5}$ of a scr.	=			$16\frac{1}{5}$
	4	6	2	$18\frac{1}{11}$

(35)

	qr.	na.	in.
$\frac{1}{2}$ of a yard	= 2	1	$1\frac{1}{2}$
$\frac{1}{4}$ of an Eng. ell	=	2	$1\frac{1}{4}$
$\frac{1}{4}$ of a qr.	=	3	$0\frac{1}{4}$
	3	3	$1\frac{3}{4}$

(36)

	in.
$\frac{1}{2}$ of a yd.	= $5\frac{1}{2}$
$\frac{1}{2}$ of a ft.	= $1\frac{1}{2}$
$\frac{1}{2}$ of an in.	= $\frac{1}{2}$
	7

(37)

	fur.	per.	yds.	ft.	in.
$\frac{1}{11}$ of a mile	= 5	3	3	1	6
$\frac{1}{2}$ of a fur.	=	12	1	2	$0\frac{1}{2}$
$\frac{1}{22}$ of a yd.	=			1	$2\frac{1}{11}$
	5	16	0	0	$3\frac{3}{11}$

(38)

	day	hrs.	min.
$\frac{1}{4}$ of a week	= 1	18	0
$\frac{1}{2}$ of a day	=	8	0
$\frac{1}{6}$ of an hour	=		12
	2	2	12

(39)

	s.	d.
$\frac{1}{2}$ of a £	= 2	$10\frac{1}{2}$
$\frac{1}{3}$ of a s.	=	$2\frac{1}{3}$
$\frac{1}{12}$ d.	=	$\frac{1}{12}$
	3	$1\frac{1}{4}$

$$\begin{aligned} \frac{1}{2} &= \frac{1}{2} \\ &= 61\frac{1}{2} \\ &= 15\frac{1}{2} \end{aligned}$$

$$+ (1\frac{1}{2} +$$

$$- \frac{1000}{1000} =$$

$$\begin{aligned} \text{na. in.} \\ 1 \quad 1\frac{1}{2} \\ 2 \quad 1\frac{1}{2} \\ 3 \quad 0\frac{1}{2} \\ 3 \quad 1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{ft. in.} \\ 1 \quad 6 \\ 2 \quad 0\frac{1}{2} \\ 1 \quad 2\frac{1}{2} \\ 0 \quad 3\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{d.} \\ 10\frac{1}{2} \\ 2\frac{1}{2} \\ 1\frac{1}{2} \\ 1\frac{1}{2} \end{aligned}$$

(40)

	£	s.	d.
$\frac{1}{2}$ of 21s.	=	13	$1\frac{1}{2}$
$\frac{1}{2}$ of 5s.	=	3	$1\frac{1}{2}$
$\frac{1}{2}$ of £3 12s. 6d.	=	2	5 $3\frac{1}{2}$
$\frac{1}{2}$ of a £	=	10	$9\frac{1}{2}$
$\frac{1}{2}$ d.	=		$\frac{1}{2}$
		3	12 $4\frac{1}{2}$

Page 171.

(7)

$$\frac{1}{2} - \frac{1}{20} = \frac{10}{20} - \frac{1}{20} = \frac{9}{20} = \frac{9}{20}.$$

(8)

$$\begin{aligned} \frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \frac{1}{2} &= \frac{3 \times 48}{17 \times 11} = \frac{144}{187} \\ \frac{144}{187} &= \frac{144}{187} = 1\frac{1}{2} \\ \frac{81}{187} &= \frac{81}{187} = \frac{35 \times 11}{4 \times 70} = \frac{11}{4 \times 2} = \frac{11}{8} = 1\frac{3}{8} \\ 1\frac{3}{8} - 1\frac{1}{2} &= 0. \end{aligned}$$

(9)

$$\begin{aligned} 982\frac{1}{2} - 29\frac{1}{2} &= 982\frac{1}{2} - 29\frac{1}{2} = 981 + 1\frac{1}{2} - 29\frac{1}{2} \\ 29\frac{1}{2} &= 981\frac{1}{2} - 29\frac{1}{2} = 952\frac{1}{2}. \end{aligned}$$

(10)

$$\begin{aligned} 69\frac{1}{2} - 18\frac{1}{2} &= 69\frac{1}{2} - 18\frac{1}{2} = 68 + 1\frac{1}{2} - 18\frac{1}{2} = 50\frac{1}{2} \\ 68\frac{1}{2} - 18\frac{1}{2} &= 50\frac{1}{2} = 50\frac{1}{2}. \end{aligned}$$

(11)

$$100\frac{1}{2} - 9\frac{1}{2} = 100\frac{1}{2} - 9\frac{1}{2} = 99 + 1\frac{1}{2} - 9\frac{1}{2} = 99\frac{1}{2} - 9\frac{1}{2} = 90\frac{1}{2}.$$

(12)

$$\begin{aligned} \frac{1}{2} \text{ of } 2\frac{1}{2} &= 2\frac{1}{2} = 4\frac{1}{2}. \quad 6\frac{1}{2} - 4\frac{1}{2} = 6\frac{1}{2} - 4\frac{1}{2} = 5 + 1\frac{1}{2} - 4\frac{1}{2} = 5\frac{1}{2} \\ 5\frac{1}{2} - 4\frac{1}{2} &= 1\frac{1}{2}. \end{aligned}$$

(13)

$$\begin{aligned} 611\frac{1}{2} - 610\frac{1}{2} &= 611\frac{1}{2} - 610\frac{1}{2} = 610 + 1\frac{1}{2} - 610\frac{1}{2} = 1\frac{1}{2} \\ 610\frac{1}{2} - 610\frac{1}{2} &= 610\frac{1}{2} - 610\frac{1}{2} = 0. \end{aligned}$$

(14)

$$\frac{5}{9} \text{ of } \frac{1}{3} = \frac{10}{27}. \quad \frac{1}{3} + \frac{1}{9} = \frac{2}{9} + \frac{1}{9} = \frac{3}{9} = \frac{1}{3}. \quad \frac{5}{9} \text{ of } \frac{1}{3} = \frac{1}{9}.$$

$$\frac{10}{27} - \frac{1}{9} = \frac{10}{27} - \frac{3}{27} = \frac{7}{27}.$$

(15)

$$\begin{array}{r} \text{oz. dr.} \\ \frac{3}{4} \text{ of a lb.} = 10 \ 10\frac{3}{4} \\ \frac{3}{8} \text{ of a dr.} = \frac{9}{8} \\ \hline 10 \ 9\frac{7}{8} \end{array}$$

(16)

$$\begin{array}{r} 24\frac{1}{4} - 21\frac{1}{4} = 24\frac{7}{8} - 21\frac{2}{8} = \\ 23 + 1\frac{7}{8} - 21\frac{2}{8} = 23\frac{5}{8} - \\ 21\frac{2}{8} = 2\frac{3}{8}. \end{array}$$

(17)

$$\begin{array}{r} \text{fur. per. yds. ft. in.} \\ \frac{3}{4} \text{ of a mile} = 1 \ 31 \ 0 \ 1 \ 10 \\ \frac{1}{4} \text{ of a fur.} = \quad \quad 25 \ 2 \ 1 \ 6 \\ \hline 1 \ 5 \ 3 \ 1 \ 10 \end{array}$$

(18)

$$\frac{3}{4} \text{ of } 1\frac{1}{2} = 1\frac{1}{2} = 7\frac{1}{2}. \quad \frac{1}{16} \text{ of } 4\frac{1}{2} = \frac{9}{32} = 1\frac{1}{32}.$$

$$7\frac{1}{2} - 1\frac{1}{32} = 7\frac{16}{32} - 1\frac{1}{32} = 6 + 1\frac{15}{32} - 1\frac{1}{32} = 6\frac{14}{32} - 1\frac{1}{32} = 5\frac{13}{32}.$$

(19)

$$\frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{5}{8} \text{ of } \frac{3}{4} \text{ of } \frac{5}{6} = \frac{1 \times 3 \times 2 \times 3 \times 3 \times 6 \times 5}{2 \times 4 \times 8 \times 4 \times 3 \times 6} = \frac{15}{16}.$$

$$12\frac{319}{64} + 1\frac{55}{64} = 12\frac{319}{64} + 1\frac{55}{64} = 12\frac{374}{64} = 12\frac{187}{32} = 12\frac{187}{32}.$$

$$\frac{17\frac{9}{16}}{13\frac{3}{8}} = \frac{196}{11 \times 56} = \frac{21}{2} = 10\frac{1}{2}.$$

$$12\frac{319}{64} - 10\frac{1}{2} = 12\frac{319}{64} - 10\frac{8}{16} = 2\frac{239}{64}.$$

(20)

$$3\frac{1}{2} + 8\frac{1}{2} + 5\frac{1}{2} + 6\frac{1}{2} = 3 + 8 + 5 + 6 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}) =$$

$$22 + (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}).$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{20} + \frac{3}{20} + \frac{3}{20} + \frac{3}{20} = \frac{10}{20} = \frac{1}{2}.$$

$$22 + \frac{1}{2} = 22\frac{1}{2}.$$

$$3\frac{3}{5} + 2\frac{2}{5} + 16\frac{1}{5} = 3 + 2 + 16 + (\frac{3}{5} + \frac{2}{5} + \frac{1}{5}) = 21 +$$

$$(\frac{3}{5} + \frac{2}{5} + \frac{1}{5}).$$

$$\frac{3}{5} + \frac{2}{5} + \frac{1}{5} = \frac{6}{50} + \frac{8}{50} + \frac{2}{50} = \frac{16}{50} = \frac{8}{25} = 1\frac{1}{25}.$$

$$22\frac{1}{2} - 22\frac{8}{25} = 22\frac{12}{25} - 22\frac{8}{25} = \frac{4}{25} = \frac{1}{6\frac{1}{4}}.$$

(21)

$$\begin{array}{rcl} \text{r. per. yds. ft. in.} \\ \frac{1}{11} \text{ of an acre} & = & 1 \ 18 \ 5 \ 4 \ 72 \\ \frac{1}{3} \text{ of a per.} & = & 13 \ 4 \\ \hline & & 1 \ 17 \ 22 \ 2 \ 108 \end{array}$$

(22)

$$\begin{aligned} 16\frac{1}{7} - 9\frac{1}{4} &= 16\frac{12}{133} - 9\frac{33}{133} = 15 + 1\frac{12}{133} - 9\frac{33}{133} = 15\frac{152}{133} - 9\frac{33}{133} = 6\frac{54}{133}. \\ 169\frac{17}{100} - 83\frac{17}{100} &= 169\frac{321}{1000} - 83\frac{350}{1000} = 168 + 1\frac{321}{1000} - 83\frac{350}{1000} = 168\frac{1521}{1000} - 83\frac{3500}{1000} = 85\frac{671}{1000}. \end{aligned}$$

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(6)

$$\frac{7}{12} \text{ of } \frac{5}{6} = \frac{7 \times 5}{12 \times 6} = 3\frac{5}{12}.$$

(7)

$$\frac{5}{8} \times \frac{4}{5} = \frac{1}{2}.$$

(8)

$$\frac{4}{15} \times \frac{5}{24} = \frac{1}{6}.$$

(9)

$$\frac{7}{8} \times \frac{5}{6} \times \frac{7}{8} = 3\frac{45}{64}. \quad \frac{14}{1} \times \frac{241}{16} \times \frac{32}{9} = \frac{14 \times 241 \times 2}{9} = 749\frac{2}{9} = 749\frac{2}{9}.$$

(10)

(11)

$$\frac{3}{10} \times \frac{7}{4} \times \frac{9}{11} \times \frac{11}{12} = \frac{3 \times 7 \times 9}{2 \times 4 \times 4} = \frac{189}{32} = 5\frac{29}{32}.$$

(12)

$$\frac{4}{5} \times \frac{8}{11} \times \frac{9}{17} \times \frac{182}{200} \times \frac{5}{9} = \frac{3 \times 182}{11 \times 17 \times 25} = 6\frac{42}{475}.$$

(13)

$$\frac{3}{8} \times \frac{11}{8} \times \frac{3}{8} \times \frac{3}{21} \times \frac{8}{5} \times \frac{5}{1} = \frac{3 \times 3 \times 3}{2} = \frac{27}{2} = 13\frac{1}{2}.$$

(14)

$$\frac{2}{8} \times \frac{8}{5} \times \frac{6}{11} \times \frac{4}{19} \times \frac{11}{209} = \frac{2 \times 6 \times 4}{5} = \frac{48}{5} = 9\frac{3}{5}.$$

(15)

$$\frac{18}{2} \times \frac{80}{7} \times \frac{180}{11} \times \frac{2}{18} \times \frac{7}{80} \times \frac{1}{90} = \frac{1}{11}.$$

(16)

$$\frac{4}{7} \times \frac{3}{11} \times \frac{9}{18} \times \frac{77}{1} \times \frac{8}{7} \times \frac{8}{18} \times \frac{13}{21} \times \frac{167}{24} \times \frac{3 \times 9 \times 167}{4} = \frac{4202}{1} = 1127\frac{1}{2}.$$

(17)

$$\frac{1}{8} \times \frac{8}{19} \times \frac{64}{8} \times \frac{12}{101} \times \frac{3}{7} \times \frac{2}{8} = \frac{1}{7 \times 101} = \frac{1}{707}.$$

(18)

$$\frac{1}{4} \times \frac{2}{1} \times \frac{2}{7} \times \frac{19}{1} = \frac{2 \times 2 \times 19}{7} = \frac{76}{7} = 10\frac{6}{7}.$$

$\frac{1}{2} = 13\frac{1}{2}$.

$$\frac{9}{10} \times \frac{7}{1} \times \frac{11}{15} \times \frac{32}{11} = \frac{9 \times 7 \times 32}{5} = 201\frac{2}{5} = 403\frac{1}{2}.$$

(20)

$$\frac{27}{4} \times \frac{7}{8} \times \frac{4}{5} \times \frac{4}{7} = \frac{27}{10} = 2\frac{7}{10}.$$

(21)

$$\frac{11}{8} \times \frac{13}{8} \times \frac{15}{1} = \frac{11 \times 13 \times 15}{8} = 268\frac{1}{8}.$$

(22)

$$\frac{1}{8} \times \frac{7}{4} \times \frac{8}{15} \times \frac{15}{2} \times \frac{11}{11} \times \frac{16}{17} \times \frac{49}{8} \times \frac{4}{5} \times \frac{27}{31} \times \frac{31}{2} \times \frac{191}{188} = \frac{7 \times 49 \times 27 \times 191}{2 \times 11 \times 17} = 4729\frac{3}{17}.$$

(23)

$$\frac{27}{37\frac{1}{2}} \times \frac{87\frac{1}{2}}{98\frac{1}{2}} \times \frac{1}{2\frac{1}{2}} \times \frac{81\frac{1}{2}}{128} = \frac{27}{152} \times \frac{175}{735} \times \frac{2}{7} \times \frac{162}{128} = \frac{27 \times 5}{152} \times \frac{735 \times 8}{8 \times 735} \times \frac{7 \times 8}{8 \times 7} \times \frac{888 \times 1}{11 \times 128} = \frac{5}{3 \times 11} = \frac{5}{33}.$$

(24)

$$\frac{5}{11} \times \frac{1}{7} \times \frac{3}{5} \times \frac{17}{10} = \frac{3 \times 17}{11 \times 7} = \frac{51}{77}.$$

(25)

$$\frac{75\frac{1}{2}}{6\frac{1}{11}} \times \frac{\frac{2}{3} \text{ of } 8\frac{1}{2} \times \frac{1}{15} \text{ of } 28}{\frac{1}{11} \text{ of } 6\frac{2}{3} \times \frac{1}{17} \text{ of } 24} \times \frac{7\frac{1}{2}}{15} \times \frac{2}{5} \times 14\frac{2}{3} \times \frac{100}{121} \times$$

$$\frac{4}{5\frac{1}{2}} \times \frac{5}{9} =$$

$$\frac{60\frac{3}{8}}{97} \times \frac{\frac{2}{3} \times 3\frac{2}{3} \times \frac{1}{15} \times 2\frac{2}{3}}{\frac{1}{11} \times 6\frac{1}{2} \times \frac{1}{17} \times 2\frac{1}{4}} \times \frac{3\frac{5}{8}}{1\frac{5}{11}} \times \frac{2}{5} \times \frac{101}{7} \times \frac{100}{121} \times$$

$$\frac{1}{1\frac{5}{8}} \times \frac{5}{2} =$$

$$\frac{9}{808 \times 11} \times \frac{11 \quad 4}{3 \times 33 \times 28 \times 11 \times 8 \times 17} \times \frac{9}{38} \times \frac{8 \times 7}{5 \times 15} \times \frac{8 \times 7}{4 \times 5} \times$$

$$\frac{8 \times 67}{5} \times \frac{15 \times 2 \times 51 \times 24}{8 \times 2} \times \frac{4}{5} =$$

$$\frac{101}{7} \times \frac{20}{121} \times \frac{2}{4 \times 8} \times \frac{5}{7 \times 9} =$$

$$\frac{11 \times 9 \times 101}{5 \times 7 \times 16} = \frac{9999}{560} = 17\frac{179}{560}.$$

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(28)

$$\frac{180 \text{ d. } 23 \text{ h.}}{36} = 5 \text{ d. } 0 \text{ h. } 38 \text{ min. } 20 \text{ sec.}$$

(29)

$$\frac{1}{4} \text{ of } £29 = \frac{£29 \times 13}{42} \times \frac{£377}{42} = £8 \text{ } 19\text{s. } 6\frac{7}{12}\text{d.}$$

$$\times \frac{100}{121} \times$$

$$\times \frac{100}{121} \times$$

$$\times \frac{3 \times 7}{4 \times 5} \times$$

(30)

$$\frac{1}{3} \text{ of } 186 \text{ a. } 3 \text{ r.} = \frac{186 \text{ a. } 3 \text{ r.} \times 7}{9} = \frac{1307 \text{ a. } 1 \text{ r.}}{9} = 145 \text{ a. } 1 \text{ r.}$$

(31)

$$\frac{1}{4} \text{ of } \frac{2}{3} \text{ of } \frac{1}{10} \text{ of } \frac{1}{2} \text{ of } 24 \text{ h. } 30 \text{ m.} = \frac{1}{15} \text{ of } 24 \text{ h. } 30 \text{ m.} = 1 \text{ h. } 38 \text{ m.}$$

(32)

$$\frac{2}{3} \text{ of } \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{1}{2} \text{ of } 33 \text{ bu. } 2 \text{ p. } 1 \text{ ga.} = \frac{2}{9} \text{ of } 33 \text{ bu. } 2 \text{ p. } 1 \text{ ga.} = 33 \text{ bu. } 2 \text{ p. } 1 \text{ ga.} \times 7 = 235 \text{ b. } 1 \text{ p. } 1 \text{ g.}$$

$$\frac{235 \text{ b. } 1 \text{ p. } 1 \text{ g.}}{90} = \frac{235 \text{ b. } 1 \text{ p. } 1 \text{ g.}}{90} = 2 \text{ b. } 2 \text{ p. } 0 \text{ g. } 3 \text{ q. } 1 \frac{1}{2} \text{ p.}$$

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(5)

$$\frac{1}{2} \text{ of } \frac{3}{4} \div \frac{1}{2} \text{ of } \frac{3}{4} = \frac{1}{2} \times \frac{3}{5} \times \frac{4}{3} \times \frac{4}{35} = \frac{2 \times 4}{5 \times 35} = \frac{8}{175}.$$

(6)

$$\frac{15}{22} \div \frac{2}{3} \div \frac{1}{11} = \frac{15}{22} \times \frac{3}{2} \times \frac{11}{1} = \frac{5}{2 \times 3} = \frac{5}{6}.$$

(7)

$$82 \frac{1}{17} \div 26 \frac{4}{11} = \frac{155}{17} \times \frac{41}{119} = \frac{155 \times 41}{17 \times 119} = \frac{6355}{2023} = 3 \frac{286}{2023}.$$

in. 20 sec.

(8)

$$2 \frac{1}{2} \div \frac{1}{2} = \frac{5}{2} \div \frac{1}{2} = \frac{5}{2} \times \frac{2}{1} = \frac{5 \times 2}{11} = \frac{20}{11} = 1 \frac{9}{11}.$$

E

(9)

$$1\frac{1}{2} \div \frac{1}{7} \text{ of } 2\frac{1}{2} \text{ of } 16 \text{ of } \frac{3}{4} \text{ of } \frac{1}{10} = \frac{7}{2} \times \frac{7}{1} \times \frac{4}{11} \times \frac{1}{18} \times \frac{4}{85} \times$$

$$\frac{2}{70} = \frac{7 \times 7}{2 \times 11} = \frac{49}{22} = 2\frac{5}{11}.$$

(10)

$$2\frac{1}{2} \div (\frac{1}{2} \div \frac{1}{11} \text{ of } 9) = \frac{7}{2} \div (\frac{1}{2} \text{ of } \frac{3}{2} \text{ of } \frac{1}{2}) = \frac{7}{2} \times \frac{9}{5} \times \frac{3}{8} \times \frac{1}{16} \times$$

$$\frac{3}{2} = \frac{7 \times 9 \times 3 \times 3}{5 \times 16} = \frac{567}{80} = 7\frac{7}{80}.$$

(11)

$$48\frac{1}{2} \div \frac{2}{3} + \frac{1}{2} \text{ of } 6 = \frac{97}{2} \div \frac{2}{3} + \frac{3}{2} = \frac{97}{2} \div \frac{2}{3} = \frac{97}{2} \times \frac{3}{2} = \frac{97 \times 18}{89} = \frac{1746}{89} = 19\frac{54}{89}.$$

(12)

$$6\frac{1}{2} \div \frac{2}{3} \text{ of } \frac{9}{10} + \frac{3}{17} = \frac{13}{2} \div \frac{2}{3} + \frac{3}{17} = \frac{13}{2} \div \frac{2}{3} = \frac{13}{2} \times \frac{3}{2} = \frac{39}{4} = 9\frac{3}{4}.$$

(13)

$$\frac{2}{3} \times \frac{1}{10} \div \frac{2}{3} \times \frac{3}{4} = \frac{2}{3} \times \frac{10}{3} \times \frac{4}{9} \times \frac{4}{25} = \frac{4 \times 4}{3 \times 5} \times \frac{16}{15} = 1\frac{1}{15}.$$

$$\frac{1}{16} \times \frac{4}{85} =$$

$$\frac{9}{5} \times \frac{3}{16} \times$$

$$\frac{97}{2} \times \frac{18}{89} =$$

$$\frac{259}{880} = \frac{13}{2} \times$$

$$\frac{16}{15} = 1\frac{1}{3}.$$

(14)

$$\frac{\frac{57}{4}}{\frac{25}{3}} \div \frac{7}{3} = \frac{67 \times 3}{9 \times 35} \div \frac{3 \times 8}{7 \times 33} = \frac{67 \times 7}{3 \times 35} \times \frac{7 \times 33}{8 \times 8} =$$

$$\frac{67 \times 11}{3 \times 5 \times 8} = \frac{737}{120} = 6\frac{17}{120}.$$

(15)

$$\frac{10}{20} \div \frac{11}{11} \div \frac{7}{122} = \frac{11}{11} \times \frac{11}{4} \times \frac{7}{122} = \frac{5 \times 10 \times 7}{9 \times 61} = \frac{35}{9}.$$

(16)

$$\frac{1}{3} \text{ of } \frac{1}{3} \text{ of } \frac{1}{3} \text{ of } \frac{1}{3} \div \frac{1}{3} \text{ of } \frac{1}{3} \text{ of } \frac{1}{3} \text{ of } \frac{1}{3} = \frac{3}{4} \times \frac{10}{13} \times \frac{3}{4} \times \frac{7}{5} \times \frac{6}{5} \times$$

$$\frac{28}{3} \times \frac{4}{3} \times \frac{1}{5} = \frac{3 \times 2 \times 7 \times 6}{13 \times 5} = \frac{252}{65} = 3\frac{12}{65}.$$

(17)

$$\frac{7}{2} \div \frac{7}{2} = \frac{7 \times 2}{4 \times 9} \div \frac{7 \times 4}{3 \times 9} = \frac{7 \times 2}{4 \times 9} \times \frac{3 \times 9}{7 \times 4} = \frac{3}{2 \times 4} = \frac{3}{8}.$$

(18)

$$\frac{2}{3} \div \frac{21}{35} = \frac{3}{25} \div \frac{21 \times 2}{5 \times 35} = \frac{3}{25} \times \frac{5 \times 35}{21 \times 2} = \frac{1}{2}.$$

(19)

$$\frac{113}{8} \times \frac{1}{9} \div \frac{7}{3} \times \frac{107}{13} \times \frac{13}{13} = \frac{113}{8} \times \frac{1}{9} \times \frac{7}{3} \times \frac{13}{107} \times$$

$$\frac{2 \times 13}{7 \times 13} = \frac{113 \times 2 \times 17}{9 \times 3 \times 107} = \frac{3842}{2889} = 1\frac{253}{2889}.$$

(20)

$$\frac{3\frac{1}{2}}{2} \times \frac{\frac{7}{9}}{7 \times 7} \times \frac{\frac{1}{3}}{7 \times 3} \times \frac{\frac{7}{10}}{7} \div \frac{\frac{4\frac{1}{2}}{7}}{41} \times \frac{\frac{3}{12}}{3 \times 4} \times \frac{\frac{7}{2}}{8 \times 7} \times \frac{\frac{1\frac{1}{4}}{4}}{11 \times 7} =$$

$$\frac{3\frac{1}{2}}{2} \times \frac{2 \times 9}{7 \times 7} \times \frac{7 \times 3}{2} \times \frac{7}{10 \times 3} \div \frac{7}{9 \times 7} \times \frac{3 \times 4}{19} \times \frac{7 \times 2}{8 \times 7} \times \frac{11 \times 7}{4 \times 4} =$$

$$\frac{31}{2} \times \frac{2 \times 9}{7 \times 7} \times \frac{7 \times 3}{2} \times \frac{7}{10 \times 3} \times \frac{9 \times 7}{41} \times \frac{19}{8 \times 4} \times \frac{8 \times 7}{7 \times 2} \times \frac{4 \times 4}{11 \times 7} =$$

$$\frac{31 \times 3 \times 9 \times 19 \times 4}{5 \times 41 \times 11} = \frac{63612}{2255} = 28\frac{473}{2255}.$$

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(22)

$$\frac{1\frac{1}{2}}{\frac{5}{8}} = \frac{19 \times 3}{11 \times 5} = \frac{57}{55}. \quad \text{£8 14s. 6}\frac{1}{2}\text{d.} \div \frac{57}{55} = \text{£8 14s. 6}\frac{1}{2}\text{d.} \times \frac{55}{57} =$$

$$\frac{\text{£8 14s. 6}\frac{1}{2}\text{d.} \times 55}{57} = \text{£8 8s. 5}\frac{1}{2}\text{d.}$$

(23)

$$\frac{2\frac{3}{4}}{5} \times \frac{1\frac{1}{2}}{1\frac{1}{10}} = \frac{115}{115}. \quad 1 \text{ m. } 5 \text{ fur. } 91 \text{ yds. } 2 \text{ ft.} \div \frac{115}{115} = 1 \text{ m. } 5 \text{ fur. } 91 \text{ yds. } 2 \text{ ft.} \times \frac{115}{115} =$$

$$\frac{1 \text{ m. } 5 \text{ fur. } 91 \text{ yds. } 2 \text{ ft.} \times 22}{115} = 2 \text{ fur. } 124 \text{ yds. } 2 \text{ ft.}$$

(24)

$$3 \text{ a. } 3 \text{ r. } 3 \text{ per.} \div \frac{3}{2} = 3 \text{ a. } 3 \text{ r. } 3 \text{ p.} \times \frac{2}{3} = \frac{3 \text{ a. } 3 \text{ r. } 3 \text{ p.} \times 5}{3} =$$

$$6 \text{ a. } 1 \text{ r. } 5 \text{ per.}$$

(25)

$$\text{£7 16s. } 2\text{d.} \div \frac{1}{4} = \text{£7 16s. } 2\text{d.} \times \frac{4}{1} = \frac{\text{£7 16s. } 2\text{d.} \times 9}{4} =$$

$$\text{£17 11s. } 4\frac{1}{2}\text{d.}$$

(4)

$$\frac{3}{4} + \frac{1}{4} = \frac{3}{16} + \frac{4}{16} = \frac{7}{16}.$$

(5)

$$\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{8} = \frac{4}{20} + \frac{2}{20} + \frac{4}{20} + \frac{2.5}{20} = \frac{12.5}{20} = \frac{5}{8}.$$

1 or $\frac{1}{8} - \frac{3}{8} = \frac{1}{8}.$

(6)

$$\frac{5\frac{1}{2} - 2\frac{1}{2}}{3\frac{1}{2} + \frac{2}{5}} \text{ of } \frac{4\frac{1}{2} + 5\frac{1}{2}}{4\frac{1}{5}} \text{ of } \frac{2\frac{3}{4} + 1\frac{1}{4}}{7\frac{1}{2} - 2\frac{1}{2}} = \frac{5\frac{1}{2} - 2\frac{1}{2}}{3\frac{1}{2} + \frac{2}{5}} \text{ of } \frac{4\frac{1}{2} + 5\frac{1}{2}}{\frac{1}{10}} \text{ of } \frac{2\frac{3}{4} + 1\frac{1}{4}}{7\frac{1}{2} - 2\frac{1}{2}} = \frac{3\frac{1}{2}}{4\frac{1}{5}} \text{ of } \frac{10\frac{1}{2}}{\frac{1}{10}} \text{ of } \frac{4\frac{1}{5}}{5\frac{1}{2}} = \frac{1\frac{1}{2}}{\frac{1}{10}} \text{ of } \frac{4\frac{1}{5}}{\frac{1}{10}} = \frac{1\frac{1}{2}}{\frac{1}{10}} = 15.$$

$$\frac{7}{8} \times \frac{2 \times 57}{5 \times 8} \times \frac{8 \times 64}{5 \times 188} = \frac{2 \times 64}{5 \times 3 \times 5} = \frac{128}{75} = 1\frac{53}{75}.$$

(7)

$$1670\frac{7}{13} \times 12\frac{1}{13} \text{ cts.} = 217\frac{11}{13} \times 12\frac{1}{13} = 2604\frac{12}{169} \text{ cts.} = \$212.99\frac{12}{169}.$$

(8)

$\frac{1}{2}$ of the longer = $\frac{2}{3}$ of the shorter; therefore $\frac{1}{2}$ of the longer = $\frac{1}{3}$ of $\frac{2}{3}$ = $\frac{2}{9}$ of the shorter.

Hence the longer = $\frac{2}{9} \times 3 = \frac{2}{3}$ of the shorter.

The whole tree = longer + shorter = $\frac{2}{3} + \frac{1}{3}$ of shorter = $\frac{1}{2}$ of the shorter.

If 136 ft. = $\frac{1}{2}$ of the shorter, $\frac{1}{2}$ of 136 = 68 = $\frac{1}{2}$ of the shorter.

Hence shorter = $68 \times 2 = 136$ ft.; and longer = $136 - 68 = 68$ ft.

(9)

$$97\frac{1}{2} + 117\frac{1}{2} + 500\frac{1}{2} + 333\frac{1}{2} = 97\frac{30}{60} + 127\frac{10}{60} + 500\frac{10}{60} + 333\frac{10}{60} = 1057\frac{60}{60} = 1058.$$

$$\$1000 + \$1375\frac{1}{2} + \$6831 + \$4013\frac{1}{2} = \$1000 + \$1375\frac{1}{2} + \$6831 + \$4013\frac{1}{2} = \$13219\frac{1}{2} = \$13219.625.$$

(10)

$$12\frac{5}{8} + 1\frac{3}{8} = 13\frac{8}{8} = 14. \quad 8\frac{1}{2} + 1\frac{1}{10} = 9\frac{6}{10} = 9\frac{3}{5}. \quad 13\frac{1}{10} - 9\frac{3}{5} = 3\frac{2}{10} = \frac{1}{5}.$$

$$7\frac{5}{8} - 6\frac{1}{8} = \frac{4}{8} = \frac{1}{2}. \quad \frac{2\frac{1}{2}}{50} \times \frac{2}{3} \times \frac{1}{2} = \frac{232}{100} = 14\frac{2}{100}.$$

$$\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = \frac{3}{2}. \quad \frac{1}{2} \div \frac{3}{4} = \frac{1}{2} \times \frac{4}{3} = \frac{2}{3}. \quad 7\frac{5}{8} - \frac{1}{8} = 7\frac{4}{8} = \frac{29}{4}.$$

(11)

$$19\frac{1}{2} \times \$6\frac{1}{2} = 125 \times \$2\frac{1}{2} = \$312\frac{1}{2} = \$134.15\frac{1}{2}.$$

(12)

$$376\frac{1}{4} \times \$75\frac{1}{2} = 2172 \times \$60\frac{1}{2} = 40477\frac{1}{2} = \$28387.06\frac{1}{2}.$$

(13)

$$147\frac{1}{2} + 320\frac{1}{2} = 147\frac{1}{2} + 320\frac{1}{2} = 467\frac{1}{2}. \quad 467\frac{1}{2} - 156\frac{1}{2} = 311\frac{1}{2}.$$

(14)

$$\frac{7 \text{ (1 of 3)}}{\frac{1}{6} \left(\frac{3}{3\frac{1}{2}} \text{ of } 7 \right)} \div 7\frac{1}{2} = \frac{7 \times \frac{1}{2} \times \frac{1}{2}}{\frac{1}{6} \times \frac{1}{2} \times \frac{1}{2}} \div \frac{14}{2} = \frac{7 \times 3 \times 3}{1 \times 2 \times 4} \times \frac{2}{83} =$$

$$\frac{7 \times 3 \times 3}{1 \times 2 \times 4} \times \frac{2}{83} = 1. \quad \frac{\frac{1}{2} + \frac{1}{2} + \frac{1}{2}}{\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}} = \frac{\frac{3}{2} + \frac{3}{2} + \frac{3}{2}}{\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}} =$$

$$\frac{\frac{9}{2}}{\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}} = \frac{2535}{2176} = 1\frac{359}{2176}.$$

(15)

$$17\frac{1}{2} \div 7\frac{1}{2} = 1\frac{2}{2} \div \frac{5}{2} = 1\frac{2}{2} \times \frac{2}{5} = \frac{4}{5} = 2\frac{1}{5}.$$

$$= 3\frac{3}{4} = 2\frac{1}{2}.$$

$$- \frac{1}{2} = \frac{27}{50}.$$

$$- 15\frac{1}{2}.$$

$$8387.06\frac{1}{2}.$$

$$- 156\frac{1}{2} =$$

$$\frac{3}{4} \times \frac{2}{3} =$$

$$\frac{1}{4} + \frac{1}{2} =$$

$$= 1\frac{359}{176}.$$

(16)

$$3\frac{1}{2} + 4\frac{1}{2} + 4\frac{1}{2} = 3\frac{1}{2} + 4\frac{1}{2} + 4\frac{1}{2} = 12\frac{3}{2} = 7\frac{1}{2}.$$

$$7\frac{1}{2} - 5\frac{1}{2} = 7\frac{1}{2} - 5\frac{1}{2} = 2\frac{1}{2} = \frac{5}{2}.$$

$$94\frac{1}{2} + 93\frac{1}{2} = 94\frac{1}{2} + 93\frac{1}{2} = 187\frac{1}{2} = 187\frac{1}{2}.$$

$$\frac{723}{100} \times \frac{22}{10} \div \frac{13481}{72} = \frac{723}{100} \times \frac{17}{85} \times \frac{72}{13481} = \frac{1}{100}.$$

(17)

$$2\frac{1}{2} + \frac{1}{2} + 4 = 2\frac{1}{2} + \frac{1}{2} + 4 = 7\frac{1}{2} = 7\frac{1}{2}.$$

$$2 \div \frac{1}{2} = 2 \times \frac{2}{1} = 4. \quad 1\frac{1}{2} - \frac{1}{2} = \frac{1}{2} - \frac{1}{2} = 0.$$

$$1\frac{1}{2} + \frac{1}{2} = 2. \quad 5\frac{1}{2} - 4\frac{1}{2} = 4\frac{1}{2} - 4\frac{1}{2} = 0.$$

$$\frac{583}{72} = \frac{7}{10} = 4\frac{1}{2}.$$

(18)

$$\frac{1}{2} + \frac{1}{2} = 1. \quad 1\frac{1}{2} + 2\frac{1}{2} = 4\frac{1}{2} = 4\frac{1}{2}. \quad 2\frac{1}{2} - 1\frac{1}{2} = 1\frac{1}{2} = 1\frac{1}{2}.$$

$$3\frac{1}{10} - \frac{1}{2} = 2\frac{1}{10} = 2\frac{1}{10}. \quad \frac{5}{8} \times \frac{40}{12} \times \frac{2}{7} \times \frac{187}{70} = \frac{187}{3 \times 12} = \frac{187}{36} = 5\frac{1}{6}.$$

$$1\frac{1}{2} \div 2\frac{1}{2} = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}. \quad 5\frac{1}{2} \div 3\frac{1}{2} = \frac{11}{2} \times \frac{2}{7} = \frac{11}{7} = 1\frac{4}{7}. \quad \frac{1}{70} + 1\frac{1}{2} = 2\frac{1}{2}.$$

(19)

$$1 - (\frac{1}{2} + \frac{1}{2}) = 0. \quad \frac{2}{3} \text{ of } \frac{1}{2} = \frac{1}{3}. \quad \frac{1}{2} - \frac{1}{2} = 0. \quad \frac{1}{2} + \frac{1}{2} = 1. \quad \frac{1}{2} - \frac{1}{20} = \frac{9}{20}. \quad \frac{1}{20} \text{ of } \$40000 = \$1333.33\frac{1}{3}.$$

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(13)

$$\frac{1}{2} = 2) 1 \quad \frac{3}{8} = 8) 3$$

$$\cdot 5 \quad \cdot 375$$

(14)

$$\frac{2}{25} = 25) 9 \quad \frac{1}{5} = 5) 1$$

$$\cdot 36 = \frac{36}{100} \quad \cdot 25 = \frac{25}{100}$$

$$2\frac{1}{2}.$$

(15)

75)73 ($\cdot 9733+$	123)574($4\cdot 666+$	34)15 ($\cdot 44117+$
<u>67\cdot 5</u>	<u>492</u>	<u>13\cdot 6</u>
5\cdot 50	82\cdot 0	1\cdot 40
5\cdot 25	73\cdot 8	1\cdot 36
<u>\cdot 250</u>	<u>8\cdot 20</u>	<u>40</u>
\cdot 225	7\cdot 38	34
<u>250</u>	<u>\cdot 820</u>	<u>60</u>
225	\cdot 738	34
<u>25</u>	<u>82</u>	<u>260</u>
		238
		<u>22</u>

(16)

7)6	12)5	9)4
<u>\cdot 857142</u>	<u>\cdot 4166+</u>	<u>\cdot 44444+</u>

(17)

112)17 ($\cdot 15178571428+$	1296)718 ($\cdot 554012+$
<u>11\cdot 2</u>	<u>648\cdot 0</u>
5\cdot 80	800
5\cdot 60	784
<u>\cdot 200</u>	<u>160</u>
\cdot 112	112
<u>880</u>	<u>480</u>
784	448
<u>960</u>	<u>320</u>
896	224
<u>640</u>	<u>960</u>
560	896
<u>800</u>	<u>64</u>

44117+

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(20)

(21)

(22)

12)1·0 in.

12)17·0 grs.

20)7·0 grs.

3)2·083333 ft.

2)1·41666666

3)2·35 scr.

5)3·694444 yd.

20)3·70833333 dwt.

8)·7833333 dr.

2

11) 7·388688

12)·18541666 oz.

12)·0979166 oz.

40)·671717 per.

·01545138+ lb.

·0081597+ lb.

·01679+ fur.

(23)

(24)

(26)

12)9·0 in.

4)2·0 na.

60)21·0 sec.

3)2·75 ft.

4)3·5 qr.

60)55·35 min.

5)2·91666

·875 yd.

12)12·9225 hr.

2

11)5·83333

2)1·076875

40)35·53030 per.

(25)

·5384375 day.

8)5·88825 fur.

13s. 4d. = 160d.

·73603+ mile.

5s. = 60d.

$\frac{60}{160} = \frac{3}{8} = \cdot375$

(27)

(28)

$\frac{7}{8}$ of $\frac{1}{2}$ of 6d. = $\frac{7}{8}$ d. and $\mathcal{L}\frac{1}{4} = 80$ d.

$\frac{3}{8}$ of $\frac{1}{2}$ of 1 mil. = 12672 in.

$\frac{3}{8}$ d. = $\frac{1}{80}$ of $\frac{3}{8}$ of $\mathcal{L}\frac{1}{4} = \frac{3}{2240}$ of $\mathcal{L}\frac{1}{4}$.

3)12672

$27 \div 2240 = 0\cdot012053$.

2

7)25344

3620·571428+

(29)

 $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{1}{4}$ lbs. = $\frac{1}{30}$ lb. = $110\frac{1}{18}$ drs. = $166\frac{2}{3}$ drs. $\frac{1}{2}$ of an oz. = 12 drs. = $166\frac{2}{3} \div 12 = 180$

180)1664(9.2444+

1620

440

360

800

720

800

720

800

720

80

(30)

2)1.0 pts.

4)1.5 qt.

2)1.375 gal.

4)3.6875 pk.

.921875 bush.

Page 186.

(33)

.3945

24

15780

7890

9.4680 hrs.

60

28.0800 min.

60

4.8000 sec.

(34)

.3965

8

3.1720 fur.

40

6.8800 per.

5 $\frac{1}{2}$

44000

4400

4.8400 yds.

3

2.5200 ft.

12

6.2400 in.

(35)

.309153

20

6.183060 dwt.

24

732240

366120

4.393440 grs.

(36)

$$22.75 = 22\frac{3}{4} = 22\frac{1}{2}.$$

$$£2\ 2s. 6d. \times 22\frac{1}{2} = £48\ 6s. 10\frac{1}{2}d.$$

(37)

$$7\ b. 1\ p. 1\ g. 1\ qts. = 237\ qts.$$

$$11.17825 \times 237 = 2649.24525\ qt. =$$

$$82\ b. 3\ p. 0\ g. 1\ q. 0.4905\ pts.$$

(38)

$$\cdot 2057$$

$$12$$

$$\hline \cdot 24684\ oz.$$

$$20$$

$$\hline 9.3680\ dwt.$$

$$24$$

$$\hline 14720$$

$$\hline 7360$$

$$\hline 8.8320\ grs.$$

(39)

$$1\ f. 36\ p. 2\ y. 5\ in. = 15125\ in.$$

$$15125 \times .176 = 2662\ in. =$$

$$13\ per. 2\ yds. 1\ ft. 4\ in.$$

(40)

$$\cdot 625$$

$$3$$

$$\hline 1.875\ mil.$$

$$8$$

$$\hline 7.000\ fur.$$

(41)

$$\cdot 015625$$

$$4$$

$$\hline \cdot 062500\ pk.$$

$$2$$

$$\hline \cdot 125000\ gal.$$

$$4$$

$$\hline \cdot 500000\ qt.$$

$$2$$

$$\hline 1.000000\ pt.$$

(42)

$$\cdot 9378$$

$$4$$

$$\hline 3.7512\ r.$$

$$40$$

$$\hline 30.0480\ per.$$

$$30\frac{1}{2}$$

$$\hline 14400$$

$$120$$

$$\hline 1.4520\ yd.$$

$$9$$

$$\hline 4.0680\ ft.$$

$$144$$

$$\hline 2720$$

$$2720$$

$$\hline 680$$

$$9.7920\ in. = 9\frac{82}{100}\ in.$$

(43)

$$1\ sq. yd. 3\ ft. 72\ in. = 1800\ in.$$

$$\cdot 2775 \times 1800 = 499.5\ in. =$$

$$3\ ft. 67\frac{1}{2}\ in.$$

l.

k.

bush.

dwt.

grs.

Page 191.

(54)

$$\begin{array}{r} \cdot 8 \\ \hline \end{array} = \frac{8}{9}.$$

$$\begin{array}{r} \cdot 05 \\ \hline \end{array} = \frac{5}{99}.$$

$$\begin{array}{r} \cdot 342 \\ \hline \end{array} = \frac{342}{999} = \frac{38}{111}.$$

$$\begin{array}{r} \cdot 7004 \\ \hline \end{array} = \frac{7004}{9999}.$$

$$\begin{array}{r} \cdot 002003 \\ \hline \end{array} = \frac{2003}{99999}.$$

(55)

$$\begin{array}{r} \cdot 19 \\ \hline \end{array} = \frac{19}{99}.$$

$$\begin{array}{r} \cdot 1067 \\ \hline \end{array} = \frac{1067}{9999} = \frac{37}{909}.$$

$$\begin{array}{r} \cdot 11115 \\ \hline \end{array} = \frac{11115}{99999} = \frac{1235}{11111}.$$

$$\begin{array}{r} \cdot 704103 \\ \hline \end{array} = \frac{704103}{999999} = \frac{334791}{333333}.$$

(56)

$$\begin{array}{r} \cdot 102 \\ \hline \end{array} = \frac{102}{999} = \frac{34}{333}.$$

$$\begin{array}{r} \cdot 0013 \\ \hline \end{array} = \frac{13}{9999}.$$

$$\begin{array}{r} \cdot 00007103 \\ \hline \end{array} = \frac{7103}{99999999}.$$

$$\begin{array}{r} \cdot 01020304 \\ \hline \end{array} = \frac{1020304}{99999999}.$$

$$\begin{array}{r} \cdot 987654321 \\ \hline \end{array} = \frac{987654321}{999999999} = \frac{109739369}{111111111}.$$

Page 192.

(58)

$$\begin{array}{r} \cdot 8325 \\ \hline 83 \end{array}$$

$$\frac{8325}{9900} = \frac{1121}{4950}.$$

$$\begin{array}{r} \cdot 147658 \\ \hline 147 \end{array}$$

$$\frac{147658}{999000}.$$

$$\begin{array}{r} \cdot 4320075 \\ \hline 432 \end{array}$$

$$\frac{4320075}{9999000} = \frac{1438881}{3333000}.$$

(59)

$$\begin{array}{r} 875 \cdot 4965 \\ \hline 49 \end{array}$$

$$\frac{8754965}{9900} = \frac{8751229}{2475}.$$

$$\begin{array}{r} 301 \cdot 82756 \\ \hline 82 \end{array}$$

$$\frac{30182756}{99900} = \frac{3019186}{11100} = \frac{3014534}{11100}.$$

(60)

$$\begin{array}{r} \cdot 083 \\ 8 \\ \hline \end{array} \quad \begin{array}{l} 714285 \\ 9999990 = 714285 \\ 6734 = 14. \end{array} \quad \begin{array}{l} 72365 \\ 1111110 = 72365 \\ 701010 = 701010 \\ 701010 = 701010 \end{array}$$

$$\frac{76}{900} = \frac{1}{12}$$

$$\begin{array}{r} \cdot 123456 \\ 123 \\ \hline \end{array}$$

$$\frac{123456}{999000} = \frac{411111}{333000}$$

(61)

$$\begin{array}{r} \cdot 7034 \\ 703 \\ \hline \end{array} \quad \begin{array}{r} \cdot 96432 \\ 96 \\ \hline \end{array} \quad \begin{array}{l} 8331 \\ 9000 \\ \hline \end{array} \quad \begin{array}{l} 83336 \\ 99900 = 10704 \\ 10704 = 3568 = 882 \end{array}$$

$$\begin{array}{r} \cdot 00207 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} \cdot 143271 \\ 1432 \\ \hline \end{array} \quad \begin{array}{r} 205 \\ 99000 = \frac{41}{19500} \\ \hline \end{array} \quad \begin{array}{r} 141839 \\ 990000 \\ \hline \end{array}$$

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(63)

Dissimilar. Similar. Similar and Coterminous.

$$\begin{array}{l} \cdot 9 \\ 6 \cdot 327 \\ 19 \cdot 43 \\ 27 \cdot 0278 \\ \cdot 0347123 \end{array} \quad \begin{array}{l} = \\ = \\ = \\ = \\ = \end{array} \quad \begin{array}{l} \cdot 99999 \\ 6 \cdot 327272 \\ 19 \cdot 43000 \\ 27 \cdot 027878 \\ \cdot 0347123 \end{array} \quad \begin{array}{l} = \\ = \\ = \\ = \\ = \end{array} \quad \begin{array}{l} \cdot 999999999 \\ 6 \cdot 327272727 \\ 19 \cdot 430000000 \\ 27 \cdot 027878787 \\ \cdot 0347123123 \end{array}$$

2 carried.

$$\text{Sum,} = 53 \cdot 8198638274$$

Dissimilar.		Similar.	(64)	Similar and Coterminous.
7·427	=	7·42727	=	7·4272727272727
9·1234	=	9·123423	=	9·123423423423423
17·2987643	=	17·2987643	=	17·298764376437643
18·67	=	18·67676	=	18·6767676767676
2 carried.				
Sum, = 52·526228203901471				

Dissimilar.		Similar.	(65)	Similar and Coterminous.
4·95	=	4·959595	=	4·9595959595
7·164	=	7·1641641	=	7·1641641641
4·7123	=	4·7123123	=	4·7123123123
·97317	=	·97317	=	·9731777777
2 carried.				
Sum; = 17·8092502138				

Dissimilar.		Similar.	(66)	Similar and Coterminous.
1·5	=	1·5000	=	1·500000000
99·083	=	99·0830	=	99·083000000
·162	=	·162162	=	·162162162
·814	=	·814814	=	·814814814
2·93	=	2·93939	=	2·939393939
3·769230	=	3·769230769	=	3·769230769
97·26	=	97·2666	=	97·266666666
134·09	=	134·09090	=	134·090909090
3 carried.				
Sum, = 339·626177443				

Cotermious.

727

423

643

676

2 carried.

471

terminous.

carried.

Cotermious.

00

00

62

14

39

39

36

00

3 carried.

13

Pages 194, 195.]

KEY.

85

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(68)

Dissimilar.		Similar.		Similar and Cotermious.
729·3427	=	729·342742	=	729·342742
93·126	=	93·1260	=	93·126000
				<u>636·216742</u>

(69)

Dissimilar.		Similar.		Similar and Cotermious.
1·437291	=	1·43729137	=	1·4372913729137
·00713	=	·00713	=	·0071313131313
				<u>1·4301800597824</u>

(70)

Dissimilar.		Similar.		Similar and Cotermious.
1·12754	=	1·12754	=	1·12754754754754
·47384	=	·473847	=	·47384738473847
				<u>·65370016280907</u>

(71)

Dissimilar.		Similar.		Similar and Cotermious.
42·18763	=	42·1876333	=	42·1876333333
17·0000008432	=	17·0000008432	=	17·0000008432
				<u>25·1876324900</u>

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(74)

$$2\dot{\cdot}9 = 2\frac{2}{3} = 3. \quad 7\cdot 25 \times 3 = 21\cdot 75.$$

(75)

$$\dot{\cdot}297 = \frac{297}{999} = \frac{1}{3} \text{ and } 7\cdot 72 = \frac{772}{100} = \frac{718}{100} = \frac{183}{25}.$$

$$\frac{1}{3} \times \frac{183}{25} = \frac{183}{75} = 2\cdot 2951\dot{3}.$$

(76)

$$\dot{\cdot}818 = \frac{818}{999} = \frac{2}{11} \text{ and } \cdot 77 = \frac{77}{100}. \quad \frac{2}{11} \times \frac{77}{100} = \frac{22}{100} = \cdot 63.$$

(77)

$$1\cdot 735 = \frac{1735}{999} = \frac{1364}{999} = \frac{259}{183} \text{ and } \cdot 47053 = \frac{47053}{99999} = \frac{3539}{78855}.$$

$$\frac{259}{183} \times \frac{3539}{78855} = \frac{2031141}{801111} = \cdot 81654168350.$$

(78)

$$4\cdot 722 = \frac{4722}{999} = 4\frac{12}{99} = 4\frac{4}{33} \text{ and } \cdot 198 = \frac{198}{999} = \frac{22}{111}.$$

$$\frac{4}{33} \times \frac{22}{111} = \frac{88}{3699} = \cdot 935.$$

(80)

$$\dot{\cdot}082 = \frac{82}{999} \text{ and } \cdot 123 = \frac{123}{999} = \frac{41}{333}.$$

$$\frac{82}{999} \div \frac{41}{333} = \frac{82}{999} \times \frac{333}{41} = \frac{2}{3} = \cdot 6.$$

(81)

$$389\cdot 185 = \frac{389185}{999} = \frac{388796}{999} \text{ and } 15\cdot 7 = 15\frac{7}{10} = \frac{142}{10}.$$

$$\frac{388796}{999} \div \frac{142}{10} = \frac{388796}{999} \times \frac{10}{142} = \frac{2738}{111} = 24\cdot 6.$$

(82)

$$\cdot 81654168350 = \frac{81654168350}{999999999999} = \frac{10206760837}{12499997800}.$$

$$\cdot 47053 = \frac{47053}{99999} = \frac{12587}{25500}.$$

$$\frac{10206760837}{12499997800} \div \frac{12587}{25500} = \frac{10206760837}{12499997800} \times \frac{25500}{12587} = \frac{10206760837}{5881660785} =$$

$$1\cdot 735.$$

(83)

$$\cdot\ddot{45} = \frac{45}{100} = \frac{9}{20} \text{ and } \cdot\dot{118881} = \frac{118881}{1000000} = \frac{17}{143}$$

$$\frac{9}{20} \div \frac{17}{143} = \frac{9}{20} \times \frac{143}{17} = \frac{9}{17} = 3 \cdot 8235294117647058 \cdot$$

MISCELLANEOUS EXERCISES.

(84)

$$\frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{1}{5} \text{ of } 14 = \frac{1}{2} \times \frac{3}{4} \times \frac{1}{5} \times 14 = \frac{21}{20} = 1 \cdot 05$$

(85)

$$\cdot\dot{67} = \frac{67}{100} \text{ and } 2 \cdot \ddot{13} = 2 \frac{13}{100} = 2 \frac{13}{100}$$

$$\frac{67}{100} \times 2 \frac{13}{100} = \frac{871}{1000} = 1 \cdot 4445566778 +$$

(86)

$$\begin{array}{l} \text{wk.} \\ \cdot 678125 = 4 \text{ days } 17 \text{ hours } 55 \text{ minutes } 30 \text{ seconds.} \\ 7 \end{array}$$

$$\begin{array}{r} 4 \cdot 746875 \text{ days.} \\ \hline 24 \end{array}$$

(87)

$$\cdot 92437$$

$$\begin{array}{r} 2987500 \\ \hline 1493750 \end{array}$$

$$92$$

$$\cdot 92347 = \frac{92347}{100000} = 1 \cdot 8469$$

$$\begin{array}{r} 17 \cdot 925000 \text{ hours.} \\ \hline 60 \end{array}$$

$$\begin{array}{r} 55 \cdot 500000 \text{ minutes.} \\ \hline 60 \end{array}$$

$$\begin{array}{r} 30 \cdot 000000 \text{ seconds.} \end{array}$$

(88)

Dissimilar.		Similar.		Similar and Coterminous.
-------------	--	----------	--	--------------------------

$$67\cdot234 = 67\cdot2343434 = 67\cdot23434343434$$

$$98\cdot713 = 98\cdot71371371 = 98\cdot71371371371$$

$$91\cdot03471234 = 91\cdot03471234 = 91\cdot03471234234$$

$$\text{Sum,} = 256\cdot98276949039$$

Dissimilar.

Similar and Coterminous.

$$256\cdot98276949039 = 256\cdot98276949039$$

$$100\cdot123456789 = 100\cdot12345678945$$

$$\text{Difference} = 156\cdot85931270094$$

(89)

$$12) 9 \text{ in.}$$

$$3) 2\cdot75 \text{ ft.}$$

$$51) 2\cdot916 \text{ yds.}$$

$$2 \quad 2$$

$$11) 5\cdot833$$

$$40) 36\cdot5303 \text{ rds.}$$

$$8) 5\cdot913257 \text{ fur.}$$

$$739157196 \text{ miles.}$$

(90)

$$17\cdot428571 \text{ sq. ft.} = 17\cdot428571 \text{ sq. ft.} = 17\cdot428571 \text{ sq. ft.} = 17 \text{ sq. ft. } 61\frac{1}{2} \text{ in.}$$

$$100\cdot8 \text{ sq. in.} = 100\frac{1}{2}$$

$$\text{Difference,} = 16 \text{ sq. ft. } 104\frac{1}{2} \text{ in.}$$

terminous.

3434

71371

4234

9039

inous.

9

5

4

$$91789772$$

$$917897$$

$$91789772 \text{ of } 2 \text{ a.} = \frac{91789772}{99000000} \times \frac{1}{2} \text{ a.} = \frac{91789772}{198000000} = \frac{1}{21} = 1 \text{ a. } 3 \text{ r. } 13 \text{ per. } 22 \text{ yds.}$$

(92)

$$\begin{array}{r} 11 \cdot 287 \\ 2 \end{array}$$

$$11 \cdot 287 = \frac{11287}{1000} = 11 \frac{287}{1000}. \quad 1 \cdot 0428571 = \frac{10428571}{9999999} = 1 \frac{428571}{9999999}$$

(93)

$$1 \cdot 345 = \frac{1345}{1000} \text{ a.} \quad 1 \cdot 76 = \frac{176}{100} = \frac{176}{100}$$

$$\frac{1345}{1000} \div \frac{176}{100} = \frac{1345}{1000} \times \frac{100}{176} = \frac{134500}{176000} = 26 \cdot 7837428571.$$

(94)

Dissimilar. Similar. Similar and Coterminous.

$$85 \cdot 62 = 85 \cdot 626 = 85 \cdot 62626$$

$$13 \cdot 76432 = 13 \cdot 76432 = 13 \cdot 76432$$

$$\text{Difference,} = 71 \cdot 86193$$

(95)

(96)

$$734 \text{ of a lb.} = 11 \cdot 744 \text{ oz.}$$

$$198 \text{ of an oz.} = 198 \text{ oz.}$$

$$\text{Difference,} = 11 \cdot 546 \text{ oz.}$$

$$2 \text{ ft. } 5 \frac{1}{2} \text{ in.} = 29 \frac{1}{2} \text{ in.} = \frac{59}{2} \text{ in.}$$

$$27 \cdot 3 \text{ ft.} = 27 \frac{3}{10} \text{ ft.} = 328 \text{ in.}$$

$$20 \cdot 16 \text{ ft.} = 20 \frac{16}{100} \text{ ft.} = 242 \text{ in.}$$

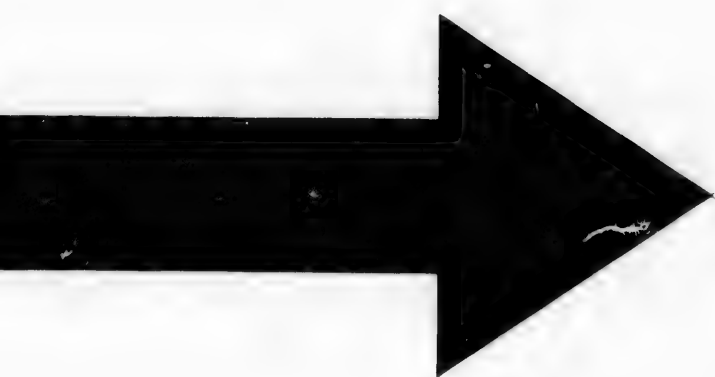
$$328 \times 242 \div \frac{88}{3} = \frac{328}{1} \times \frac{242}{1} \times \frac{3}{88} = 2706 \text{ in.} = 75 \frac{1}{2} \text{ yds.}$$

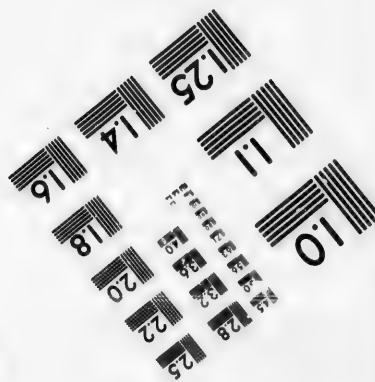
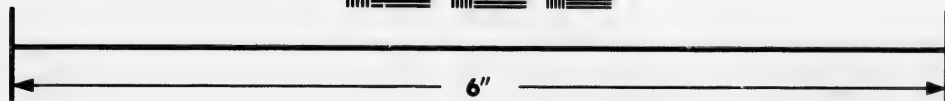
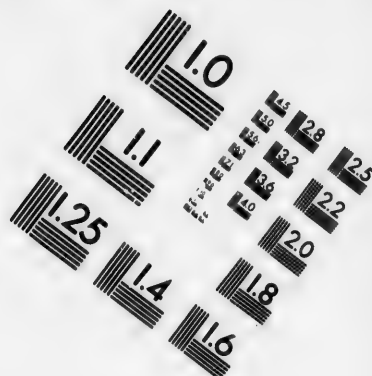
(97)

$$3 \cdot 145 = \frac{3145}{990} = 3 \frac{145}{990} = \frac{173}{110} \text{ and } 4 \cdot 297 = \frac{4297}{990} = 4 \frac{297}{990} = \frac{169}{37}.$$

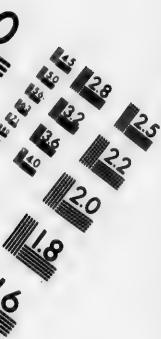
$$\frac{173}{110} \times \frac{169}{37} = \frac{27507}{2030} = 13 \cdot 5169533.$$







**23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503**



(98)

$40 = 2^3 \times 5$. Therefore the equivalent decimal will contain 3 places.

$\frac{7}{24}$	"	$24 = 2^3 \times 3$	"	"	"	"	"	3	"
$\frac{15}{144}$	"	$15 = 5 \times 3$	"	"	"	"	"	1	"
$\frac{144}{90}$	"	$144 = 2^4 \times 3^2$	"	"	"	"	"	4	"
$\frac{90}{3584}$	"	$90 = 2 \times 5 \times 3^2$	"	"	"	"	"	1	"
	"	$3584 = 2^9 \times 7$	"	"	"	"	"	9	"

(99)

$$81\dot{3} = 81\cdot\dot{6} \text{ and } 328\dot{3}\dot{3} = 328\cdot\dot{2}\dot{3}.$$

Dissimilar.

Similar.

Similar and Coterminous.

$81\cdot\dot{6}$	=	$81\cdot\dot{6}\dot{6}\dot{6}$	=	$81\cdot\dot{6}\dot{6}\dot{6}\dot{6}\dot{6}\dot{6}$
$61\cdot\dot{1}\dot{2}\dot{6}$	=	$61\cdot\dot{1}\dot{2}\dot{6}$	=	$61\cdot\dot{1}\dot{2}\dot{6}\dot{6}\dot{6}\dot{6}\dot{6}$
$328\cdot\dot{2}\dot{3}$	=	$328\cdot\dot{2}\dot{3}\dot{2}\dot{3}$	=	$328\cdot\dot{2}\dot{3}\dot{2}\dot{3}\dot{2}\dot{3}\dot{2}\dot{3}$
$5\cdot\dot{6}\dot{2}\dot{4}$	=	$5\cdot\dot{3}\dot{2}\dot{4}\dot{6}\dot{2}$	=	$5\cdot\dot{6}\dot{2}\dot{4}\dot{6}\dot{2}\dot{4}\dot{6}\dot{2}$
				2 carried.

$$\text{Sum,} = 476\cdot\dot{6}\dot{5}\dot{0}\dot{2}\dot{8}\dot{1}\dot{1}\dot{9}$$

(100)

$$\begin{aligned} & \left(\frac{4\cdot\dot{4} - 2\cdot\dot{8}\dot{3}}{1\cdot\dot{6} + 2\cdot\dot{6}\dot{2}\dot{9}} \times \frac{6\cdot\dot{8} \times 3}{2\cdot\dot{2}\dot{5}} \right) + \frac{2\cdot\dot{8} \times 2\cdot\dot{2}\dot{7}}{1\cdot\dot{1}\dot{3}\dot{6}} \\ &= \left(\frac{1\cdot\dot{6}\dot{1}}{4\cdot\dot{2}\dot{9}\dot{6}} \times \frac{20\cdot\dot{4}}{2\cdot\dot{2}\dot{5}} \right) + \frac{2\dot{4} \times 2\dot{3}\dot{7}}{1\dot{3}\dot{6}\dot{6}} \\ &= \left(\frac{1\dot{5}\dot{5}}{4\dot{2}\dot{9}\dot{6}} \times \frac{20\dot{4}}{2\dot{4}} \right) + \frac{2\dot{4} \times 2\dot{7}\dot{7}}{1\dot{3}\dot{6}} \\ &= \left(\frac{1\dot{1}\dot{1}}{1\dot{3}\dot{6}\dot{6}} \times \frac{10\dot{2}}{\dot{4}} \right) + \frac{1\dot{4} \times \dot{4}\dot{4}}{2\dot{7}} \\ &= \left(\frac{2\dot{9}}{1\dot{3}\dot{6}\dot{6}} \times \frac{3\dot{4}}{\dot{4}} \right) + \frac{1\dot{4} \times \dot{4}\dot{4}}{2\dot{7}} \\ &= \left(\frac{\dot{1}}{1\dot{1}\dot{1}} \times \frac{3\dot{4}}{\dot{4}} \right) + \frac{7\dot{0}}{2\dot{7}} = \left(\frac{1\dot{1}\dot{1}}{1\dot{1}\dot{1}} \times \frac{1\dot{3}\dot{6}}{1\dot{3}\dot{6}} \right) + \frac{2\dot{6}}{2\dot{7}} \\ &= \left(\dot{1} \times \frac{3\dot{4}}{\dot{4}} \right) + \frac{2\dot{6}}{\dot{2}\dot{7}} = \frac{1\dot{7}}{\dot{1}} + \frac{2\dot{6}}{\dot{2}\dot{7}} = \frac{4\dot{6}}{\dot{1}} = 9. \end{aligned}$$

Page 198.

(1)

V	V	V
9)4312131	3)4312131	8)4312131
9)224322..8	3)1234023..2	8)242343..7
9)12043..5	3)224322..2	8)14022..2
9)344..7	3)41240..2	8)1032..1
9)21..0	3)12043..1	8)32..6
1..2	3)2144..1	2..1

3)344..2
3)113..0
3)21..0
3)3..2
1..0

V	IX	III	VIII
4312131 =	120758 =	10200211222 =	216127
5	9	3	8
23	11	3	17
5	9	3	8
116	99	11	142
5	9	3	8
582	898	33	1137
5	9	3	8
2911	8087	99	9098
5	9	3	8
14555	72791 dec.	299	72791 dec.
5		3	
72791 decimals.		72791 dec.	

at decimal
n 3 places.

3 "
1 "
4 "
1 "
9 "

terminous.

.
66
66
3
2
2 carried.
9

2 carried.

9

7

+ 5/6

= 9.

$= 12 \times 8.$

(6)

15 yds. = 540 in. and 7 ft. = 84 in.
 6 ft. = 72 in. and 4 ft. = 48 in.
 $(540 \times 84 \times 13) - (72 \times 48 \times 13) = 589680 - 44928 = 544752.$
 $544752 \div 108 = 5044.$

(7)

=

$\frac{1}{2} \times \frac{8999}{9472}$

9 ft. 6'	4"	7'''			
11	7	9	11		
<hr/>					
	8	8	10'''	2''''	5'''''
	7	1	9	5	3
5	6	8	8	1	
104	10	2	5		
<hr/>					
111	0	9	7	4	5 5

(8)

$\frac{4\frac{1}{2} + \frac{1}{2} - \frac{1}{2}}{\frac{1}{3} + \frac{1}{6} \text{ of } \frac{1}{2}} = \frac{4\frac{1}{2} - \frac{1}{2}}{\frac{1}{3} + \frac{1}{6}} = \frac{4}{\frac{2}{3}} = \frac{11\frac{1}{2}}{\frac{1}{2}} = \frac{11\frac{1}{2}}{\frac{1}{2}} = \frac{45123}{6446} = 81\frac{111}{146}.$

(9)

(10)

pts.
 2) 782436
 4) 391218..0 pt.
 2) 97804..2 qt.
 4) 48902..0 gal.
 12225..2 pks.
 12225 bush. 2 pks. 0 gal. 2 qts.

77	77..42..27..21..33..14..7..11..63..30
27	6..27..3..3..2 8..30
10	2 2 10

$77 \times 27 \times 10 = 20790 = 1. \text{ c. m.}$

(11)

XII
28e4)36t87942(1375t·12

28e4

9e47

82t0

18679

17274

14054

11888

23882

23554

32t·0

28e·4

5t·80

55·t8

4·94

IX

3762814

9

34

9

312

9

2810

9

25298

9

227683

9

2049151

(12)

$$150528 = 2^{10} \times 3 \times 7^2.$$

$$10 + 1 = 11$$

$$1 + 1 = 2$$

$$2 + 1 = 3$$

$$11 \times 3 \times 2 = 66.$$

(13)

2 wks. 2 dys. = 16 dys.

·1234625

16

7407750

1234625

1·9754000 dys.

24

39016000

19508000

23·4096000 hrs.

60

24·5760000 min.

60

$$34·5600000 = 34\frac{1}{2} \text{ sec.}$$

(14)

$$728\frac{1}{2} = 8\frac{1}{2} + 2 \times 10 + 7 \times 10 \times 10.$$

lbs. oz. dr.

lbs. oz. dr.

$$27 \ 4 \ 3 \times 8\frac{1}{2} =$$

$$231 \ 11 \ 9\frac{1}{2}$$

10

$$272 \ 9 \ 14 \times 2 =$$

$$545 \ 3 \ 12$$

10

$$2726 \ 2 \ 12 \times 7 =$$

$$19083 \ 3 \ 4$$

$$19860 \ 2 \ 9\frac{1}{2}$$

\$98

·8 =

[(2

[(·76

[{

(3

(12-

(15)

$$\begin{aligned} \text{£}16\ 3s. \ 8\frac{1}{2}d. &= \$64.74\frac{7}{12} \text{ and } \text{£}67\ 17s. \ 7\frac{1}{2}d. = \$271.52\frac{1}{12}. \\ \$98.17 + \$42.29 + \$64.74\frac{7}{12} + \$97.19 + \$127.87\frac{1}{4} &= \$430.27\frac{1}{12}. \\ \$430.27\frac{1}{12} - \$271.52\frac{1}{12} &= \$158.75. \end{aligned}$$

$$0 \times 3 \times 7^2.$$

$$\begin{aligned} &= 11 \\ &= 2 \\ &= 3 \\ &= 66. \end{aligned}$$

(16)

$$\begin{aligned} \cdot\dot{8} &= \frac{8}{10}. \quad \cdot\ddot{76} = \frac{76}{100}. \quad \cdot\ddot{9123} = \frac{9123-91}{9900} = \frac{9033}{9900} = \frac{3011}{3300}. \\ \cdot003\ddot{3}2\dot{7} &= \frac{3327-3}{999000} = \frac{3324}{999000} = \frac{377}{111000}. \end{aligned}$$

(18)

$$\begin{aligned} &[\{(2\frac{1}{2} \times .5 \text{ of } 1\frac{1}{2}) + 9\frac{1}{2} + .09 + \frac{23}{11}\} - 11\frac{6}{7}] \div (\frac{1}{11} \text{ of } .16) \\ &[(.7632763 \times 11) \times \frac{1}{1} \text{ of } 1\frac{10}{11}] \times (\frac{1}{1} \text{ of } .2 \text{ of } .3 \text{ of } .25 \text{ of } 96) \div .2 \\ &\frac{1}{1} \text{ of } .6732467 \div \frac{1}{1} \end{aligned}$$

$$\begin{aligned} &7 \times 10 \times 10. \\ &. \text{ oz. dr.} \\ &1 \ 11 \ 9\frac{1}{2} \end{aligned}$$

$$\begin{aligned} &[\{(\frac{1}{3} \times \frac{1}{2} \times \frac{1}{4}) + 9\frac{1}{2} + \frac{1}{11} + \frac{23}{11}\} - 11\frac{6}{7}] \div (\frac{1}{11} \text{ of } \frac{1}{2}) \\ &(\frac{7633}{999} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{100} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{96}{1}) \div \frac{2}{1} \\ &\frac{1}{1} \times \frac{67324}{99999} \div \frac{1}{1} \end{aligned}$$

$$5 \ 3 \ 12$$

$$\begin{aligned} &(2 + 9\frac{1}{2} + \frac{1}{11} + \frac{23}{11}) - 11\frac{6}{7} \div \frac{1}{11} \times \frac{1}{2} \\ &\frac{7633}{999} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{100} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{96}{1} \times \frac{2}{1} \\ &\frac{1}{1} \times \frac{67324}{99999} \times \frac{1}{1} \end{aligned}$$

$$\begin{aligned} &3 \ 3 \ 4 \\ &0 \ 2 \ 9\frac{1}{2} \end{aligned}$$

$$\begin{aligned} &(12 - 11\frac{6}{7}) \div \frac{1}{11} \times \frac{1}{2} \quad \frac{1}{11} \times \frac{1}{11} \times \frac{1}{2} \quad \frac{1}{11} \\ &\frac{1}{11} \\ &\frac{16831}{11111} = \frac{1}{11} = \frac{1}{11} = \frac{1}{11} = \frac{1}{11} \end{aligned}$$

$$\frac{45555}{16831} = 3\frac{5063}{16831}.$$

(19)

8 children will have 8 children's shares.

One woman will have 3 children's shares \therefore 6 women will have
 $6 \times 3 = 18$ children's shares.

One man will have 6 children's shares \therefore 4 men will have
 $4 \times 6 = 24$ children's shares.

4 men, 6 women, and 8 child. will therefore have 50 child. shares.

$\pounds 550$ 3s. $1\frac{1}{2}$ d. $\div 50 = \pounds 11$ 0s. $0\frac{1}{2}$ d. = child's share.

$\pounds 11$ 0s. $0\frac{1}{2}$ d. $\times 3 = \pounds 33$ 0s. $2\frac{1}{2}$ d. = woman's share.

$\pounds 33$ 0s. $2\frac{1}{2}$ d. $\times 2 = \pounds 66$ 0s. $4\frac{1}{2}$ d. = man's share.

(20)

$$16\overline{7} + 19\overline{4} + 23\overline{7} + 129\overline{4} = 16 + 19 + 23 + 129 +$$

$$(\overline{7} + \overline{4} + \overline{7} + \overline{4}) = 187 + 3\overline{519} = 190\overline{519}.$$

(21)

$$8100 = 2^3 \times 3^4 \times 5^2.$$

1..3..9..27..81

1..2..4

1..3..9..27..81..2..6..18..54..162..4..12..36..108..324

1..5..25

1..3..9..27..81..2..6..18..54..162..4..12..36..108..324..

5..15..45..135..405..19..30..90..270..810..20..60..180..

540..1620..25..75..225..675..2025..50..150..450..1350..

4050..100..30..900..2700..8100.

Therefore the divisors of 8100 are 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 25, 27, 30, 36, 45, 50, 54, 60, 75, 81, 90, 100, 108, 135, 150, 162, 180, 225, 270, 300, 324, 405, 450, 540, 675, 810, 900, 1350, 1620, 2025, 2700, 4050, 8100.

(23)

$$\begin{array}{r} 2691 \overline{) 11817(4} \\ \underline{10764} \end{array}$$

$$\begin{array}{r} 1053 \overline{) 2691(2} \\ \underline{2106} \end{array}$$

$$\begin{array}{r} 585 \overline{) 1053(1} \\ \underline{585} \end{array}$$

$$\begin{array}{r} 468 \overline{) 585(1} \\ \underline{468} \end{array}$$

$$\begin{array}{r} 117 \overline{) 468(4} \\ \underline{468} \end{array}$$

(23)

$$\begin{array}{r} \text{sec.} \\ 60 \overline{) 2551443} \end{array}$$

$$60 \overline{) 42524.. 3}$$

$$24 \overline{) 708.. 44}$$

$$29.. 12$$

$$29 \text{ d., } 12 \text{ h., } 44 \text{ m., } 3 \text{ sec.}$$

$$\begin{array}{r} \text{sec.} \\ 60 \overline{) 31556928} \end{array}$$

$$60 \overline{) 525948.. 48}$$

$$24 \overline{) 8765.. 48}$$

$$365.. 5$$

$$365 \text{ d., } 5 \text{ h., } 48 \text{ m., } 48 \text{ sec.}$$

9828 is divisible by 117... 117 is the G. C. M.

$$+ 129 +$$

$$\begin{array}{r} 519 \\ 1080 \end{array}$$

(24)

$$14 \text{ ft. } 11 \text{ in.} = 179 \text{ in.}$$

$$38 \text{ miles} = 2407680 \text{ in.}$$

$$2407680 \div 179 = 13450\frac{1}{2}$$

(25)

$$11 \text{ ft.} \times 13 \text{ ft.} \times 15 \text{ ft.} = 2145 \text{ cub. ft.}$$

$$\text{One cubic foot weighs } 62\frac{1}{2} \text{ lbs. } 2145 \times 62\frac{1}{2} = 134062\frac{1}{2} = \text{weight of } 2145 \text{ cub. ft.}$$

$$\text{One gallon weighs } 10 \text{ lbs. } 134062\frac{1}{2} \div 10 = 13406\frac{1}{2} = \text{gals. in } 134062\frac{1}{2} \text{ lbs.}$$

(26)

$$£73 \times 400 = \$292.00$$

$$17\text{s.} \times 20 = 3.40$$

$$11\frac{1}{2}\text{d.} = 47 \text{ far.} \times 5 \div 12 = .19\frac{7}{12}$$

$$\begin{array}{r} £73 \quad 17\text{s.} \quad 11\frac{1}{2}\text{d.} = \$295.59\frac{7}{12} \end{array}$$

(27)

$$93\frac{4}{11} - 76\frac{1}{3} = 92\frac{1}{11} - 76\frac{1}{3} = 16\frac{1}{33} = \frac{490}{33}$$

$$\frac{490}{33} \div \frac{17}{3} = \frac{4206}{258} \times \frac{258}{17} = \frac{4206}{17} = 247\frac{7}{17}$$

(28)

$$\frac{5\frac{1}{2} \div \frac{2}{3}}{1\frac{1}{2} \text{ of } \frac{6}{5} \div 10\frac{1}{2}} \times \frac{2}{3} \text{ of } \frac{1\frac{1}{2} \text{ of } 4\frac{1}{2}}{13\frac{1}{2} \text{ of } 5\frac{1}{2}} = \frac{4\frac{1}{2} \times \frac{2}{3}}{\frac{2}{3} \times \frac{6}{5} \times 3\frac{1}{2}} \times \frac{2}{3} \times \frac{\frac{2}{3} \times 27}{11\frac{1}{2} \times \frac{1}{2}} =$$

$$\frac{4\frac{1}{2} \times 2}{1\frac{1}{2} \times 3\frac{1}{2}} \times \frac{2}{3} \times \frac{27}{27 \times 2} =$$

$$\frac{9}{4\frac{1}{2} \times 3 \times 31} \times \frac{8}{5} \times \frac{87}{2 \times 8 \times 87 \times 2} = \frac{3 \times 9 \times 31}{16 \times 2 \times 2 \times 2} =$$

$$\frac{81}{128} = 6\frac{9}{128}.$$

(29)

$$\begin{array}{r} \text{XI} \\ 5)91342 \\ \hline 5)19074..4 \\ \hline 5)4015..1 \\ \hline 5)891..0 \\ \hline 5)184..3 \\ \hline 5)39..3 \\ \hline 5)8..2 \\ \hline 1..3 \end{array}$$

$$\begin{array}{r} \text{XI} \\ 12)91342 \\ \hline 12)834..9 \\ \hline 12)773..1 \\ \hline 12)70..3 \\ \hline 6..5 \end{array}$$

$$\begin{array}{r} \text{XI} \\ 2)91342 \\ \hline 2)46176..1 \\ \hline 2)23093..0 \\ \hline 2)11541..1 \\ \hline 2)6246..0 \\ \hline 2)3153..0 \\ \hline 2)1627..0 \\ \hline 2)869..0 \\ \hline 2)434..1 \\ \hline 2)217..1 \\ \hline 2)109..0 \\ \hline 2)54..0 \\ \hline 2)27..1 \\ \hline 2)15..0 \\ \hline 2)8..0 \\ \hline 2)4..0 \\ \hline 2)2..0 \\ \hline 1..0 \end{array}$$

(29 continued.)

$$\frac{3 \times 37}{111 \times 19} =$$

$$\frac{9 \times 31}{2 \times 2 \times 2} =$$

11
42

76..1

93..0

11..1

16..0

53..0

27..0

89..0

34..1

17..1

09..0

51..0

21..1

15..0

08..0

04..0

02..0

1..0

XI	V	XII	II	
91342	13233014	65319	100000100110000101	
11	5	12	2	
100	8	77	2	260
11	5	12	2	2
1103	42	927	4	521
11	5	12	2	2
12137	213	11125	8	1043
11	5	12	2	2
133509 dec.	1068	133509 dec.	16	2086
	5		2	2
	5340		32	4172
	5		2	2
	26701		65	8344
	5		2	2
	133509 dec.		130	16688
			2	2
			260	33377
				2
				66754
				2
				133509 dec.

(30)	(31)	(32)
2)7680 = $2^3 \times 3 \times 5$	m. f. p. y. ft. in.	
2)3840	72 3 7 2 1 7	
2)1920	8	$\$47 \times 97 = \$45.59.$
2)960	579 fur.	(33)
2)480	40	$(73 \times 4 \times 11) \div 128 = 25\frac{3}{4}.$
2)240	23167 per.	$\$3.62\frac{1}{4} \times 25\frac{3}{4} = \$90.96\frac{1}{4}.$
2)120	5\frac{1}{2}	
2)60	115837	
2)30	11583\frac{1}{2}	
3)15	127420\frac{1}{2} yds.	
5	3	
	382262\frac{1}{2} ft.	
	12	
	4587157 in.	
	12	
	55045884 lines	

(34)

$$93.723 - 93\frac{11}{990} = 93\frac{788}{990} \text{ and } 29.4173 = 29\frac{111}{990} = 29\frac{37}{330}.$$

$$93\frac{788}{990} \div 29\frac{37}{330} = \frac{92786}{990} \times \frac{111}{293879} = \frac{92786 \times 111}{11 \times 293879} =$$

$$\frac{10299246}{3232669} = 3.185988 +$$

(35)

One bushel of oats weighs 34 lbs. \therefore in 73429 lbs. there are $73429 \div 34 = 2159\frac{3}{4}$ bushels.

(36)

In 719630 lbs. of wheat there are $719630 \div 60 = 11993\frac{1}{2}$ bus
 $\$1.80 \times 11993\frac{1}{2} = \$21588.90.$
 Or $\$1.80$ per bushel = 3 cents per lb.
 $719630 \times 3 = 2158890 \text{ cents.} = \$21588.90.$

(32)

$$= \$45.59.$$

$$128 = 25\frac{3}{4}.$$

$$= \$90.96\frac{1}{4}.$$

(38)

$$21389)180781(8$$

$$171112$$

(37)

$$9669)21389(2$$

$$19338$$

$$\$72.14 + \$93.76 = \$165.90$$

$$2051)9669(4$$

$$8204$$

$$\$165.90 \times 9.47 = \$1571.0730$$

$$\$1571.0730 \div 11 = \$142.8248+$$

$$1465)2051(1$$

$$1465$$

$$586)1465(2$$

$$1172$$

$$293)586(2$$

$$586$$

Last divisor 293 = G. C. M.

(39)

$$\frac{7}{11}, \frac{4}{3}, \frac{9}{7}, \frac{3}{33}, \frac{11}{14}, \frac{10}{10}, \frac{1}{2}.$$

The least common multiple of 11, 5, 7, 33, 14, 10 and 2 is 2310.

The multiplier for both terms of the first fraction is $2\frac{1}{11} = 210$; for the second, $2\frac{1}{5} = 462$; for the third, $2\frac{1}{7} = 330$; for the fourth, $2\frac{1}{3} = 70$; for the fifth, $2\frac{1}{14} = 165$; for the sixth, $2\frac{1}{10} = 231$; for the seventh, $2\frac{1}{2} = 1155$.

Multiplying by these numbers, we obtain $\frac{1470}{2310}, \frac{1344}{2310}, \frac{2970}{2310}, \frac{586}{2310}, \frac{1818}{2310}, \frac{1817}{2310}$, and $\frac{1146}{2310}$ for the required fraction.

(40)

$$\begin{aligned} \$11 \times 17 &= \$1.87. & \$37\frac{1}{2} \times 19 &= \$7.12\frac{1}{2}. & \$2.17 \times 14\frac{1}{2} &= \\ & \$31.46\frac{1}{2}. & \$27 \times 67 &= \$18.09. & \$1.37\frac{1}{2} \times 15 &= \$20.62\frac{1}{2}. \\ \$1.87 &+ \$7.12\frac{1}{2} &+ \$31.46\frac{1}{2} &+ \$4.75 &+ \$11.50 &+ \$18.09 &+ \\ & \$20.62\frac{1}{2} &+ \$7.93 &= \$103.35\frac{1}{2}. \end{aligned}$$

G

Page 210.

(17)

$$\begin{array}{l} \text{Baskets.} \\ 11 : 87 :: \$13.42 : \frac{1.22 \times \$13.42 \times 87}{11} = \$106.14 \text{ Ans.} \end{array}$$

(18)

$$\begin{array}{l} \text{Cords.} \\ 28 : 25 :: \$266 : \frac{19 \times \$266 \times 25}{28} = \$237.50 \text{ Ans.} \end{array}$$

(19)

$$\begin{array}{l} \text{days} \\ \$29.20 : \$83.60 :: 16 : \frac{4 \times \$83.60 \times 16}{29.20} = 45\frac{2}{3} \text{ days. Ans.} \end{array}$$

(20)

$$\begin{array}{l} \text{Bags.} \\ 16 : 156 :: \$12.80 : \frac{.8 \times \$12.80 \times 156}{16} = \$124.80 \text{ Ans.} \end{array}$$

(21)

$$\begin{array}{l} \text{Feet.} \\ 5 : 112 :: 7 : \frac{7 \times 112}{5} = 156\frac{4}{5} \text{ ft. Ans.} \end{array}$$

(22)

$$\begin{array}{l} \text{Cows. days.} \\ 55 : 27 :: 99 : \frac{9 \times 99 \times 27}{55} = 48\frac{2}{5} \text{ days. Ans.} \end{array}$$

(23)

$$\begin{array}{l} \text{Acres. bus.} \\ 5 : 48 :: 9 : \frac{9 \times 48}{5} = 86\frac{4}{5} \text{ bush. Ans.} \end{array}$$

(24)

$$\begin{array}{r} 11 \\ \text{Perches. days. } 2 \times 803 \\ 73 : 803 :: 2 : \frac{11}{73} = 22 \text{ days. Ans.} \end{array}$$

(25)

$$\begin{array}{r} 141 \\ \text{Pails. lbs. } 100 \times 1128 \\ 176 : 1128 :: 100 : \frac{141}{176} = 640\frac{1}{2} \text{ lbs. Ans.} \end{array}$$

(26)

$$\begin{array}{r} .58 \quad 155 \\ 108 : 465 :: \$20.88 : \frac{\$20.88 \times 155}{.58} = \$89.90 \text{ Ans.} \end{array}$$

(27)

$$\begin{array}{r} 9 \quad 639 \\ \$ \quad \$ \quad \text{brls. } 72 \times 1278 \\ 16 : 1278 :: 72 : \frac{16}{2} = 5751 \text{ barrels. Ans.} \end{array}$$

(28)

$$\begin{array}{r} 15 \\ \text{Men. Acres } 184 \times 3 \\ 11 : 3 :: 165 : \frac{11}{15} = 45 \text{ acres. Ans.} \end{array}$$

(29)

$$\begin{array}{r} 125 \\ \text{Barrels. loaves } 250 \times 67 \\ 4 : 67 :: 250 : \frac{125}{2} = 4187\frac{1}{2} \text{ loaves. Ans.} \end{array}$$

(30)

$$\begin{array}{r} 16 \times 84 \\ \text{Bushels. brls. } 16 \times 84 \\ 190 : 38 :: 16 : \frac{190}{5} = 3\frac{1}{2} \text{ barrels. Ans.} \end{array}$$

(31)

$$\begin{array}{r} \text{Days.} \quad \text{men} \quad 80 \times 12 \\ 15 : 12 :: 90 : \frac{15}{15} = 72 \text{ men. Ans.} \end{array}$$

(32)

$$\begin{array}{r} \text{D. work. brls.} \quad 2 \times 279 \\ 17 : 279 :: 2 : \frac{17}{17} = 32\frac{1}{2} \text{ barrels. Ans.} \end{array}$$

(33)

$$\begin{array}{r} \text{Hours.} \quad \text{miles.} \\ 1 : 24 :: 27 : 27 \times 24 = 648 \text{ miles. Ans.} \end{array}$$

(34)

$$\begin{array}{r} \text{Cows.} \quad \text{lbs.} \quad 30 \times 23 \\ 7 : 23 :: 30 : \frac{7}{7} = 98\frac{1}{2} \text{ lbs. Ans.} \end{array}$$

(37)

$$\begin{array}{r} 375 \quad 7 \\ 3750 \quad 21 \quad 16 \\ 16 : 16 :: \$9750 : \frac{1}{1} \times \frac{21}{28} \times \frac{16}{3} = \$42000 \text{ Ans.} \end{array}$$

(38)

$$\begin{array}{r} \text{Yard.} \quad \text{s.} \quad 5 \quad 1 \quad 2 \\ 1 : 1 :: \frac{5}{8} \times \frac{1}{4} \times \frac{2}{7} = \frac{1}{7} = 2\frac{1}{2} \text{ d. Ans.} \end{array}$$

(39)

$$\begin{array}{r} \text{Tons.} \quad \$7.49 \times 8\frac{1}{2} \quad 1.07 \quad 3 \\ 7 : 8\frac{1}{2} :: \$7.49 : \frac{7.49}{1} \times \frac{25}{3} \times \frac{3}{7} = \$80.25 \text{ Ans.} \end{array}$$

(40)

$$\begin{array}{r} \text{Yards.} \quad .14 \quad 4.06 \\ 28.42 \quad 4 \quad 5 \\ 5\frac{1}{2} : 4 :: \$28.42 : \frac{1}{1} \times \frac{4}{7} \times \frac{5}{28} = \$2.80 \text{ Ans.} \end{array}$$

(41)

Dollar. bag $\frac{4}{12} : \frac{7}{20} :: \frac{1}{3} : - \times \frac{25}{12} = \frac{7}{12}$ of a bag. Ans.

(42)

\$ \$ \$ $98\frac{1}{2} \times 472\frac{1}{2} : 98\frac{1}{2} :: 98\frac{1}{2} : -$ $\frac{98.875 \times 472.44}{100} = \$467.12\frac{1}{2}$ Ans.

(43)

Tons. days $107\frac{3}{4} \times 11\frac{1}{4} : 17\frac{3}{4} :: 107\frac{3}{4} : -$ $\frac{1180}{11} \times \frac{9}{17} \times \frac{5}{88} = 70\frac{1}{8}$ dys. Ans.

(44)

Tons. cords. $22\frac{1}{2} \times 11\frac{2}{5} : 15\frac{1}{3} :: 22\frac{1}{2} : -$ $\frac{202}{9} \times \frac{295}{26} \times \frac{18}{202} = 16\frac{7}{8}$ cords. Ans.

(45)

Yds. yds. \$ $\frac{1}{2}$ of $\frac{2}{3}$ of $3\frac{1}{2} : \frac{2}{3}$ of $\frac{1}{2}$ of $5\frac{1}{2} :: \frac{2}{3}$ of $1\frac{1}{2}$ of $4\frac{1}{2} : -$ $\frac{\frac{2}{3} \text{ of } 1\frac{1}{2} \text{ of } 4\frac{1}{2} \times \frac{1}{2} \text{ of } \frac{1}{2} \text{ of } 5\frac{1}{2}}{\frac{1}{2} \text{ of } \frac{2}{3} \text{ of } 3\frac{1}{2}} =$
 $\frac{4}{11} \times \frac{15}{896} = \$\frac{15}{224}$ Ans.

(47)

37sq. yds. 4 ft. 120 in. = 48648 in., and 9 sq. yds. 2 ft. = 11952 in.
 Inches. $11952 : 48648 :: \$3.50 : -$ $\frac{2027}{6081} \times \frac{3.50 \times 48648}{11952} = \$14.245\frac{1}{2}$ Ans.

(48)

$$12 \text{ lbs. } 10 \text{ oz.} = 154 \text{ oz.}$$

Ounces.

$$1 : 154 :: \$1.25 : 1.25 \times 154 = \$192.50 \text{ Ans.}$$

(49)

$$10 \text{ yds.} = 40 \text{ qrs., and } 3 \text{ yds. } 2 \text{ qrs.} = 14 \text{ qrs.}$$

Quarters.

$$40 : 14 :: \$3.40 : \frac{\begin{array}{r} .17 \quad 7 \\ \$3.40 \times 14 \\ \hline 4780 \\ 20 \end{array}}{20} = \$1.19 \text{ Ans.}$$

(50)

$$15 \text{ lbs. } 12 \text{ dwt. } 16 \text{ grs.} = 7504 \text{ grs., and } 13 \text{ oz. } 14 \text{ grs.} = 6254 \text{ grs.}$$

Grains.

$$7504 : 6254 :: \$3.80 : \frac{\begin{array}{r} .95 \quad 3127 \\ \$3.80 \times 6254 \\ \hline 7504 \\ 1878 \\ 938 \end{array}}{938} = \$3.167+ \text{ Ans.}$$

(51)

$$3 \text{ lbs. } 1 \text{ oz. } 11 \text{ dwt.} = 751 \text{ dwt. and } 12 \text{ lbs. } 6 \text{ oz. } 4 \text{ dwt.} = 3004 \text{ dwt.}$$

Dwt.

$$3004 : 751 :: 600 : \frac{\begin{array}{r} 150 \\ 600 \times 751 \\ \hline 8004 \\ 4 \end{array}}{4} = \$150 \text{ Ans.}$$

(52)

$$\begin{array}{l} \text{Barrels.} \quad \text{h. m. s.} \quad 2 \text{ h. } 46 \text{ m. } 30 \text{ s.} \times \frac{4}{24} \\ 54 : 24 :: 2 \text{ } 46 \text{ } 30 : \frac{\begin{array}{r} 54 \\ 2 \end{array}}{2} = 1 \text{ hr. } 14 \text{ min. Ans.} \end{array}$$

(53)

73 yds. 3 qrs. 2 na. 1 in. = 2660½ in. 3 Fl. e. 2 qrs. 1 na. = 101½ in.
 And £4 17s. 8½d. = 1172½d.

$$\begin{array}{l} \text{Inches.} \quad d. \quad 1172\frac{1}{2} \times 2660\frac{1}{2} \quad \frac{521}{4888} \\ 101\frac{1}{2} : 2660\frac{1}{2} :: 1172\frac{1}{2} : \frac{521}{4} \times \frac{5321}{2} \times \frac{4}{405} = \\ \frac{101\frac{1}{2}}{2772341} d. = £128 \text{ 6s. } 10\frac{1}{2}d. \text{ Ans.} \end{array}$$

(54)

$$\begin{array}{l} 8\frac{1}{2} \text{ lbs.} = 136\frac{1}{2} \text{ oz.} \\ \text{Ounces.} \quad s. \quad 287 \quad 305 \quad 3 \\ 4\frac{1}{2} : 136\frac{1}{2} :: 8\frac{1}{2} : \frac{287}{16} \times \frac{410}{3} \times \frac{3}{41} = \frac{5}{18} = £13 \text{ 9s. } 0\frac{1}{2}d. \text{ Ans.} \end{array}$$

(55)

$$\begin{array}{l} \text{Pages.} \quad 52 \\ 327 : 400 :: 156 : \frac{156 \times 400}{847} = 190\frac{20}{109}, \text{ i. e. on the } 191^{\text{st}} \text{ p. Ans.} \\ 109 \end{array}$$

(56)

46 a., 3 r., 14 p. = 7294 p., and 35 a., 2 r., 10 p. = 5690 p.

$$\begin{array}{l} \text{Perches.} \quad £ \quad 50 \\ 7494 : 5690 :: 100 : \frac{100 \times 5690}{7494} = £75 \text{ 18s. } 6\frac{1}{2}d. \text{ Ans.} \\ 3747 \end{array}$$

(57)

$$\begin{array}{l} \text{Days.} \quad \text{miles.} \quad 17 \\ 48 : 68 :: 12 : \frac{12 \times 17}{48} = 17 \text{ miles per day. Ans.} \\ 48 \end{array}$$

(58)

$$\begin{array}{r} \text{Shillings. lbs. } 113 \\ 21\frac{1}{2} : 32\frac{1}{2} :: 16\frac{1}{2} : \frac{113}{7} \times \frac{226}{7} \times \frac{3}{64} = \frac{32307}{1568} = 24\frac{675}{1568} \text{ lbs. Ans.} \end{array}$$

(59)

$$17493 \times 1000 \times 5 \text{ cub. ft.} = 87465000 \text{ cub. ft.}$$

$$192724 \times 1000 \times 4 \text{ cub. ft.} = 770896000 \text{ cub. ft.}$$

$$87465000 + 770896000 = 858361000 \text{ cub. ft.}$$

$$\begin{array}{r} \text{Cubic feet.} \quad \text{ton. } 858361000 \\ 9000 : 858361000 :: 1 : \frac{858361000}{9000} = 95373\frac{1}{3} \text{ tons. Ans.} \end{array}$$

(60)

$$50000 \times 9000 = 450000000 = \text{cub. ft. of gas in 50000 tons of coal.}$$

Cubic feet. hour.

Ans.

$$4 : 450000000 :: 1 : \frac{450000000}{4} = 112500000 \text{ h.} = 12842 \text{ y. } 170 \text{ d.}$$

(61)

$$\text{lbs. lbs. lbs. lb. lb.}$$

$$4 + 3 + 2 + 1 + \frac{1}{2} = 10\frac{1}{2} \text{ lbs.}$$

lbs.

$$11270$$

$$10\frac{1}{2} : 11270 :: 1 : \frac{11270}{10\frac{1}{2}} = 1073, \text{ and } 3\frac{1}{2} \text{ lbs. remaining. Ans.}$$

(62)

$$180 \text{ miles} = 180 \times 1760 = 316800 \text{ yards.}$$

Yards. day.

$$316800 \times 1$$

$$100 : 316800 :: 1 : \frac{316800}{100} = 3168 \text{ dys. or about } 8\frac{1}{2} \text{ yrs. Ans.}$$

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(4)

$$\begin{array}{l} 120 : 90 \text{ bush.} \\ 6 : 14 \text{ horses.} \end{array} \left. \vphantom{\begin{array}{l} 120 : 90 \text{ bush.} \\ 6 : 14 \text{ horses.} \end{array}} \right\} :: 56 \text{ days} : \frac{\overset{7}{56} \times \overset{15}{90} \times 14}{\underset{8}{120} \times 6} = 7 \times 14 = 98 \text{ days.}$$

(5)

$$\begin{array}{l} 28 : 32 \text{ ft. high.} \\ 8 : 15 \text{ days.} \end{array} \left. \vphantom{\begin{array}{l} 28 : 32 \text{ ft. high.} \\ 8 : 15 \text{ days.} \end{array}} \right\} :: 63 \text{ men} : \frac{\overset{9}{88} \times \overset{4}{32} \times 15}{\underset{7}{8} \times 28} = 9 \times 15 = 135 \text{ men.}$$

(6)

$$\begin{array}{l} 3 : 45 \text{ length.} \\ 1\frac{1}{4} : 1 \text{ width.} \end{array} \left. \vphantom{\begin{array}{l} 3 : 45 \text{ length.} \\ 1\frac{1}{4} : 1 \text{ width.} \end{array}} \right\} :: 1 \text{ lb.} : \frac{\frac{45}{3 \times 1\frac{1}{4}} = \frac{45}{\frac{5}{4}} = \overset{3}{45} \times 4}{\frac{15}{15}} = 3 \times 4 = 12 \text{ lbs.}$$

(7)

$$\begin{array}{l} 10 : 100 \text{ length.} \\ 1\frac{1}{4} : 1\frac{1}{4} \text{ width.} \end{array} \left. \vphantom{\begin{array}{l} 10 : 100 \text{ length.} \\ 1\frac{1}{4} : 1\frac{1}{4} \text{ width.} \end{array}} \right\} :: 3 \text{ lbs.} : \frac{3 \times 1\frac{1}{4} \times 100}{1\frac{1}{4} \times 10} = 2 \times 1\frac{1}{4} \times 10 = 25 \text{ lbs.}$$

(8)

$$\begin{array}{l} 44 : 132 \text{ tons.} \\ 18 : 5 \text{ days.} \end{array} \left. \vphantom{\begin{array}{l} 44 : 132 \text{ tons.} \\ 18 : 5 \text{ days.} \end{array}} \right\} :: 12 \text{ horses} : \frac{\overset{2}{12} \times \overset{5}{5} \times 132}{\underset{8}{44} \times 18} = 2 \times 5 = 10 \text{ horses.}$$

(9)

$$\begin{array}{l} 4 : 14 \text{ men.} \\ 7 : 10 \text{ days} \end{array} \left. \vphantom{\begin{array}{l} 4 : 14 \text{ men.} \\ 7 : 10 \text{ days} \end{array}} \right\} :: 27s. : \frac{\overset{2}{27} \times \overset{5}{14} \times 10}{\underset{2}{4} \times 7} = 27 \times 5 = 135s. = £6 \text{ } 15s.}$$

(10)

$$\begin{array}{l}
 3:5 \text{ masters.} \\
 8:10 \text{ apprentices.} \\
 5:8 \text{ weeks.} \\
 6:5\frac{1}{2} \text{ days per wk.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 3:5 \\ 8:10 \\ 5:8 \\ 6:5\frac{1}{2} \end{array}} \right\} :: \$144 : \frac{\overset{8}{24} \times \overset{2}{144} \times \overset{2}{8} \times \overset{2}{10} \times \overset{2}{5}}{\underset{5}{8} \times \underset{8}{8} \times \underset{5}{5} \times \underset{5}{5}} = \$440.$$

(11)

$$\begin{array}{l}
 6:18 \text{ s.mak.} \\
 4:5 \text{ weeks.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 6:18 \\ 4:5 \end{array}} \right\} :: 36 \text{ pairs of men's shoes : } \frac{\overset{9}{36} \times \overset{3}{18} \times 5}{\underset{5}{8} \times \underset{4}{4}} =$$

135 pairs men's and the women's = $\frac{2}{3}$ of 135 = 90 pairs.

(12)

$$\begin{array}{l}
 9:18 \text{ feet high.} \\
 4:6 \text{ days.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 9:18 \\ 4:6 \end{array}} \right\} :: 12 \text{ men : } \frac{\overset{3}{12} \times \overset{2}{18} \times 6}{\underset{4}{8} \times \underset{4}{4}} = 3 \times 2 \times 6 = 36 \text{ men.}$$

(13)

$$\begin{array}{l}
 130:390 \text{ miles.} \\
 7:14 \text{ hours.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 130:390 \\ 7:14 \end{array}} \right\} :: 3 \text{ days : } \frac{\overset{2}{3} \times \overset{3}{14} \times \overset{3}{390}}{\underset{7}{180} \times \underset{7}{7}} = 3 \times 2 \times 3 = 18 \text{ days.}$$

(14)

$$\begin{array}{l}
 10:60 \text{ oz.} \\
 22\frac{1}{2}:30 \text{ d.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 10:60 \\ 22\frac{1}{2}:30 \end{array}} \right\} :: 1 \text{ d. : } \frac{60 \times 30}{10 \times 22\frac{1}{2}} = \frac{\overset{4}{60} \times \overset{3}{30}}{\underset{1}{10} \times \underset{1}{22\frac{1}{2}}} = \frac{1}{10} \times \frac{2}{45} = 4 \times 2 = 8 \text{ d.}$$

(15)

$$\begin{array}{l}
 10:5 \text{ composers} \\
 7:14 \text{ hours.} \\
 20:40 \text{ sheets.} \\
 24:16 \text{ pages.} \\
 50:60 \text{ lines.} \\
 40:50 \text{ letters.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 10:5 \\ 7:14 \\ 20:40 \\ 24:16 \\ 50:60 \\ 40:50 \end{array}} \right\} :: 16 \text{ days : } \frac{\overset{2}{16} \times \overset{2}{5} \times \overset{2}{14} \times \overset{2}{40} \times \overset{3}{16} \times \overset{3}{60} \times \overset{3}{50}}{\underset{5}{10} \times \underset{5}{7} \times \underset{5}{20} \times \underset{8}{24} \times \underset{5}{50} \times \underset{5}{40}} =$$

$2 \times 16 = 32 \text{ days.}$

$$\begin{array}{l}
 336 : 240 \text{ men.} \\
 5 : 9 \text{ days.} \\
 10 : 12 \text{ hours.} \\
 6 : 5 \text{ degrees.} \\
 5 : 3 \text{ yards wide} \\
 3 : 2 \text{ yards deep}
 \end{array}
 \left. \vphantom{\begin{array}{l} 336 : 240 \text{ men.} \\ 5 : 9 \text{ days.} \\ 10 : 12 \text{ hours.} \\ 6 : 5 \text{ degrees.} \\ 5 : 3 \text{ yards wide} \\ 3 : 2 \text{ yards deep} \end{array}} \right\} :: 70 \text{ yards : } \frac{\overset{7}{70} \times \overset{5}{240} \times \overset{2}{9} \times 12 \times 5 \times 3 \times 2}{\underset{48}{336 \times 5 \times 10 \times 6 \times 5 \times 3}} =$$

$$9 \times 2 \times 2 = 36 \text{ yards.}$$

(17)

$$\begin{array}{l}
 6 : 12 \text{ horses.} \\
 4 : 9 \text{ months.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 6 : 12 \text{ horses.} \\ 4 : 9 \text{ months.} \end{array}} \right\} :: 16 \text{ acres : } \frac{\overset{4}{16} \times \overset{2}{12} \times 9}{\underset{8 \times 4}{8 \times 4}} = 4 \times 2 \times 9 = 72 \text{ acres.}$$

(18)

$$\begin{array}{l}
 25 : 139 \text{ persons} \\
 1 : 7 \text{ years.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 25 : 139 \text{ persons} \\ 1 : 7 \text{ years.} \end{array}} \right\} :: 300 \text{ bus. : } \frac{\overset{12}{300} \times 139 \times 7}{\underset{25}{25}} = 11676 \text{ bushels.}$$

(19)

$$\begin{array}{l}
 48 : 32 \text{ men.} \\
 36 : 864 \text{ feet long.} \\
 8 : 5 \text{ feet high.} \\
 4 : 3 \text{ feet wide.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 48 : 32 \text{ men.} \\ 36 : 864 \text{ feet long.} \\ 8 : 5 \text{ feet high.} \\ 4 : 3 \text{ feet wide.} \end{array}} \right\} :: 4 \text{ days : } \frac{\overset{2}{4} \times \overset{3}{864} \times \overset{108}{8} \times 5 \times 3}{\underset{16}{48 \times 36 \times 8 \times 4}} = 30 \text{ days.}$$

(20)

$$\begin{array}{l}
 679 : 22407 \text{ sold's.} \\
 336 : 112 \text{ days.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 679 : 22407 \text{ sold's.} \\ 336 : 112 \text{ days.} \end{array}} \right\} :: 702 \text{ bushels : } \frac{\overset{234}{702} \times \overset{33}{22407} \times 112}{\underset{3}{679 \times 336}} =$$

$$234 \times 33 = 7722 \text{ bushels.}$$

(21)

$$\begin{array}{l}
 13 : 494 \text{ suits.} \\
 19 : 27 \text{ days.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 13 : 494 \text{ suits.} \\ 19 : 27 \text{ days.} \end{array}} \right\} :: 12 \text{ tailors : } \frac{\overset{2}{12} \times \overset{27}{494} \times 27}{\underset{19 \times 19}{19 \times 19}} = 648 \text{ tailors.}$$

(22)

$$\begin{array}{l}
 17:40 \text{ head of cattle} \\
 30:51 \text{ days.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 17:40 \\ 30:51 \end{array}} \right\} :: 5 \text{ a. } 2 \text{ r. } 10 \text{ p.} : \frac{5 \text{ a. } 2 \text{ r. } 10 \text{ p.} \times 4 \times 8}{17 \times 30} =$$

$$5 \text{ a. } 2 \text{ r. } 10 \text{ p.} \times 4 = 22 \text{ a. } 1 \text{ r.}$$

(23)

$$\begin{array}{l}
 20 : 100 \text{ ft. long} \\
 6 : 4 \text{ feet wide.}
 \end{array}
 \left. \vphantom{\begin{array}{l} 20 \\ 6 \end{array}} \right\} :: 180 \text{ bricks} : \frac{30 \times 5 \times 180 \times 4}{20 \times 6} =$$

$$30 \times 5 \times 4 = 600 \text{ bricks.}$$

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(4)

$$\begin{array}{lcl}
 17 \text{ cords} & = 116 \text{ lbs.} & \\
 87 \text{ lbs.} & = 23 \text{ barrels} & \\
 19 \text{ barrels} & = 34 \text{ days' work} & \\
 92 \text{ days' work} & = 57 \text{ baskets peaches} & \\
 31 \text{ baskets peaches} & = 24 \text{ dollars} & \\
 12 \text{ dollars} & = 2 \text{ tons} & \\
 35 \text{ tons} & = x \text{ cords} &
 \end{array}
 \left. \vphantom{\begin{array}{l} 17 \\ 87 \\ 19 \\ 92 \\ 31 \\ 12 \\ 35 \end{array}} \right\} =$$

$$\frac{17 \times 87 \times 19 \times 92 \times 31 \times 12 \times 35}{116 \times 23 \times 34 \times 57 \times 24 \times 2} = \frac{31 \times 35}{4 \times 2} = \frac{1085}{2} = 135\frac{1}{2}.$$

(5)

$$\begin{array}{lcl}
 6 \text{ lbs. tea} & = 29 \text{ lbs. sugar} & \\
 17 \text{ lbs. sugar} & = 1 \text{ bushel} & \\
 27 \text{ bushels} & = 4 \text{ tons} & \\
 34 \text{ tons} & = 15 \text{ cows} & \\
 29 \text{ cows} & = 1160 \text{ dollars} & \\
 20 \text{ dollars} & = x \text{ lbs. tea.} &
 \end{array}
 \left. \vphantom{\begin{array}{l} 6 \\ 17 \\ 27 \\ 34 \\ 29 \\ 20 \end{array}} \right\} =$$

$$\frac{6 \times 17 \times 27 \times 34 \times 29 \times 20}{29 \times 1 \times 4 \times 15 \times 1160} = \frac{17 \times 17 \times 27}{5 \times 58} = \frac{7803}{290} = 26\frac{23}{290}$$

$$\begin{array}{r} 4 \quad 8 \\ 0. \times 40 \times 51 \\ \hline \end{array}$$

$$\begin{array}{r} 88 \\ 10 \end{array}$$

(6)

11 bush. barley	=	21 bush. potatoes	}
19 " potatoes	=	29 " oats	
115 " oats	=	44 " wheat	
14½ " wheat	=	38 " peas	
60 " peas	=	55 " rye	
75 " rye	=	11½ " clover sd.	
36 " clover sd.	=	x " barley	

$$\frac{11 \times 19 \times 115 \times 14\frac{1}{2} \times 60 \times 75 \times 36}{2 \quad 5 \quad 29 \quad 18} = \frac{5 \times 75 \times 18}{7 \times 11} = \frac{6750}{77} = 87\frac{1}{7}.$$

(7)

16 baskets pears	=	29 turkeys	}
17 turkeys	=	7 days' work	
7½ days' work	=	187 loaves	
3½ loaves	=	4 lbs. veal	
1 lb. veal	=	11 cents	
792 cents	=	63 lbs. sugar	
x lbs. sugar	=	21 baskets pears	

$$\frac{16 \times 17 \times 7\frac{1}{2} \times 3\frac{1}{2} \times 1 \times 792}{4 \quad 11 \quad 7 \quad 2} = \frac{11 \times 7 \times 21}{4} = \frac{1617}{4} = 404\frac{1}{4}.$$

(8)

$$\left. \begin{array}{l} 7 A = 11 B \\ 5 B = 8 C \\ 15 C = 21 D \\ 11 D = 5 E \\ 42 E = x A \end{array} \right\} = \frac{7 \times 5 \times 15 \times 11 \times 42}{11 \times 8 \times 21 \times 5} = \frac{7 \times 15}{4} = \frac{105}{4} = 26\frac{1}{4}.$$

(9)

7 barrels flour	=	23 cords
0 cords	=	11 cwt.
46 cwt.	=	£28
£77	=	9 sheep
5 sheep	=	8 tons
9 tons	=	x barrels flour

$$\begin{array}{r} 3 \quad 2 \quad 7 \\ 7 \times 8 \times 48 \times 77 \times 5 \times 9 \\ \hline 28 \times 11 \times 28 \times 9 \times 8 \end{array} = \frac{3 \times 7 \times 5}{8} = 19\frac{1}{2} = 13\frac{1}{2}.$$

(10)

15 N. England	=	20 New York
24 New York	=	22½ N. Jersey
30 New Jersey	=	20 Canada
4807½ Canada	=	x N. England

$$\begin{array}{r} 2 \quad 6 \quad 8 \quad 961\frac{1}{2} \\ 15 \times 24 \times 30 \times 4807\frac{1}{2} \\ \hline 20 \times 22\frac{1}{2} \times 20 \end{array} = 961\frac{1}{2} \times 6 = 5769 \text{ s.} = £288 \text{ 9s.}$$

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(1)

$$\frac{7}{8} \times \frac{17}{11} \times \frac{28}{29} \times \frac{11}{119} \times \frac{2}{69} = \frac{2}{3} = 2 : 3.$$

(2)

$$\begin{array}{rcl} £119 \times 400 & = & \$476.00 \\ 16s. \times 20 & = & 3.20 \\ 6\frac{1}{2}d. = 2\frac{1}{2} \text{ gr.} \times 5 \div 12 & = & .10\frac{1}{2} \\ \hline £119 \text{ 16s. } 6\frac{1}{2}d. & = & \$479.30\frac{1}{2} \end{array}$$

(4)

$$\left. \begin{array}{l} 9 : 13 = 9 \div 13 = .692 \\ 21 : 27 = 21 \div 27 = .777 \\ 7 : 10 = 7 \div 10 = .7 \\ 11 : 15 = 11 \div 15 = .733 \end{array} \right\} \text{Hence } 21 : 27 \text{ is the greatest,} \\ \text{and } 9 : 13 \text{ the least.}$$

(5)

Dissimilar.	Similar.	Similar and Coterminous.
$76 \cdot 23478$	$= 76 \cdot 234784$	$= 76 \cdot 234784784784784$
$19 \cdot 1342291$	$= 19 \cdot 1342291$	$= 19 \cdot 134229122912291$
		<hr/>
Difference,		$= 57 \cdot 100555661872493$

(6)

$71324t$ undenary = 1146287 denary, 23421 quinary = 1736 denary, and $14e7$ duodenary = 17995 denary.
 $1146287 \times 1736 = 1989954232 \div 17995 = 110583\frac{11147}{17995}$.
 $110583\frac{11147}{17995}$ denary* = $53ee3\frac{11147}{17995}$ duodenary, $12014313\frac{119416}{17995}$ quinary, and $760f0\frac{11147}{17995}$ undenary.

(7)

$$\begin{array}{l} 5.63 : 7.9 \text{ cubic inches.} \\ 1 : 1.220 \text{ spec. grav.} \end{array} \left. \vphantom{\begin{array}{l} 5.63 : 7.9 \text{ cubic inches.} \\ 1 : 1.220 \text{ spec. grav.} \end{array}} \right\} \begin{array}{l} \text{oz.} \\ \therefore 3.254 : \end{array} \frac{3.254 \times 7.9 \times 1.220}{5.63} =$$

$$\frac{31.362052}{5.63} = 5.57052 \text{ oz. Ans.}$$

* To reduce the fractional part, reduce both numerator and denominator separately.

(8)

yds. qrs. na. in. yds. qrs. na. in.

$$17) \begin{array}{r} 63 \\ 3 \\ 2 \\ 1 \end{array} (\begin{array}{r} 3 \\ 3 \\ 0 \\ 0 \end{array} \frac{1}{4}) \quad (9)$$

51

12

4

51

51

0

4

2

21

$$51 = \frac{1}{2} \div 17 = \frac{1}{34}.$$

$$\cdot 916325 \text{ of an acre} = \cdot 916325 \times 4840 =$$

$$4421 \cdot 945 \text{ sq. yds.}$$

$$4421 \cdot 945 \times \$ \cdot 67 = \$ 2962 \cdot 70 +$$

(10)

$$\frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{1}{2} \text{ of } 20 \text{ bush. } \times \cdot 5 \times \cdot 6 \times \frac{1}{2} =$$

$$\frac{1}{2} \times \frac{3}{4} \times \frac{1}{2} \times \frac{30}{4} \times \frac{1}{2} \times \frac{3}{4} \times \frac{1}{2} =$$

$$\frac{13}{32} \text{ bush.} = 1 \text{ bush. } 2 \text{ pks. } 0 \text{ gal. } 1 \text{ qt.}$$

(12)

$$\text{Whole amount of increase} = 2571437 - 1842265 = 729172.$$

$$729172 \times 100$$

$$1842265 : 100 :: 729172 : \frac{729172 \times 100}{1842265} = 39 \text{ per cent.}$$

(13)

$$\frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{18}{25} - \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{4}{5} = \frac{9}{25} - \frac{3}{5} = \frac{360}{2436}.$$

(14)

$$100 : 7 :: 11 : \frac{11 \times 7}{100} = \frac{77}{100}. \quad 11 - \frac{77}{100} = 10 \frac{23}{100}.$$

(15)

$$79 \times 16 \times £ \cdot 00163 = £ 2 \cdot 06032 = £ 2 \text{ ls. } 2 \frac{1}{2} \text{ d.}$$

(16)

$$\left. \begin{array}{l} 4 : 3 \text{ men} \\ 10 : 12 \text{ hours} \\ 20 : 35 \text{ acres} \end{array} \right\} :: 2 \frac{1}{2} \text{ days} : \frac{2 \frac{1}{2} \times 3 \times 12 \times 35}{4 \times 10 \times 20} = \frac{98}{8} = 3 \frac{1}{4} \text{ days.}$$

$$\begin{array}{r} 7347 \\ 100 \end{array}$$

2 rood

(17)

$$(\frac{1}{2} \text{ of } \frac{9}{11} \times .02 \times .456) \div (\frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \frac{1}{2} \text{ of } 51) =$$

$$6325 \times 4840 =$$

$$962 \cdot 70 +$$

$$\frac{2}{5} \times \frac{8}{11} \times \frac{1}{25} \times \frac{152}{111} \times \frac{17}{37} \times \frac{8}{8} \times \frac{1}{51} = \frac{2 \times 38}{5 \times 11 \times 25 \times 37} = \frac{76}{80875}.$$

$$.5 \times .6 \times \frac{1}{2} =$$

$$\times \frac{1}{2} \times \frac{1}{2} =$$

$$s. 0 \text{ gal. } 1 \text{ qt.}$$

(18)

$$\frac{2}{1} \times \frac{4}{5} \times \frac{13}{5} \times \frac{7}{2} \times \frac{5}{1} = 4 \times 13 = 52.$$

(19)

$$= 729172.$$

$$39 \text{ per cent.}$$

$$\left. \begin{array}{l} 50 \text{ barrels} = 125 \text{ yards} \\ 80 \text{ yards} = 6 \text{ bales} \\ 13 \text{ bales} = 3\frac{1}{2} \text{ hogsheads} \\ x \text{ hogsheads} = 1000 \text{ barrels} \end{array} \right\} =$$

$$\frac{125 \times 6 \times 3\frac{1}{2} \times 1000}{50 \times 80 \times 13} = \frac{125 \times 3 \times 3\frac{1}{2}}{2 \times 13} = 50\frac{1}{2}.$$

$$50.$$

$$436.$$

$$10\frac{23}{100}.$$

(20)

$$\frac{73 \cdot 47 \times .0063 \div 17 \cdot 2345}{\frac{7347}{100} \times \frac{63}{10000} \div \frac{57391}{3330}} = \frac{7347}{100} \times \frac{63}{10000} \div \frac{57391}{3330} = \frac{154133713}{8739100000} = .026856599989 +$$

$$1228d.$$

(21)

$$= 3\frac{1}{2} \text{ days.}$$

$$2 \text{ roods } 7 \text{ per. } 4 \text{ yds. } 3 \text{ ft. } 117 \text{ in.} = 3416481 \text{ in. and } 7 \text{ acres} = 43908480 \text{ inches.}$$

$$3416481 \div 43908480 = .0778 +$$

H

(22)

 $\frac{3}{4}$ of $\frac{3}{4}$ of $\frac{3}{4}$ of 70 miles = $\frac{1}{8}$ miles = 5.33333+ miles.

 $\cdot 73$ of 11 fur. = 8.03 fur. = 1.00375 mile.

 $5.33333 - 1.00375 = 4.32958$ miles.

(23)

274312 nonary = 167195 denary, 1101011010 = 858 denary, and
 .5555 septenary = 2000 denary.

 $167195 - 858 = 166337 \times 2000 = 332674000.$

332674000 denary = 764876837 nonary,
 = 10011110101000011001111010000 binary,
 = 11146453021 septenary.

(24)

275	|	44..275..18..190..200..225
38	|	4 18..38..19..9
18	|	2 9 9

 $275 \times 38 \times 18 = 188100 = 1. \text{ c. m.}$

(25)

10 : 6 weeks	}	men	80	$\times 5 \times 10 \times 8742 \times 20 \times 8$	=
6 : 5 days					
11 : 10 hours					
2400 : 8742 feet long					
18 : 20 feet wide					
11 : 8 feet high					

$\therefore 60 : \frac{10 \times 6 \times 11 \times 2400 \times 18 \times 11}{240 \times 8} =$
 $\frac{5 \times 2914 \times 2}{11 \times 3 \times 11} = \frac{29140}{333} = 80189.$

(26)

172000 = $2^5 \times 3^3 \times 43$. Increasing each exponent by 1 and
 multiplying them together we obtain $6 \times 4 \times 2 = 48$.

33+ miles.
mile.
s.

58 denary, and

74000.

010000 binary,

(27)

$$42 \cdot 7 = 42\frac{7}{10} = 3\frac{8}{10} \text{ and } 9 \cdot 7123 = 9\frac{7123}{10000} = 9\frac{188}{10000} = 1\frac{6171}{10000}.$$

$$\frac{388}{9} \times \frac{16171}{10000} = \frac{6255228}{149850} = 415 \cdot 471137804.$$

(28)

$$100 : 27 :: \$73 \cdot 42 : \frac{73 \cdot 42 \times 27}{100} = \$19 \cdot 8234.$$

$$\$73 \cdot 42 - \$19 \cdot 8234 = \$53 \cdot 5966.$$

(29)

$$6300 = 2^2 \times 3^2 \times 5^2 \times 7.$$

1..5..25

1..2.. 4

1..5..25..2..10..50..4..20..100

1..3.. 9

1..5..25..2..10..50..4..20..100..3..15..75..6..30..150..
12..60..300..9..45..225..18..90..450..36..180..900..
1..7

1..5..25..2..10..50..4..20..100..3..15..75..6..30..150..
12..60..300..9..45..225..18..90..450..36..180..900..7..
35..175..14..70..350..28..140..700..21..105..525..42..
210..1050..84..420..2100..63..315..1575..126..630..3150..
..252..1260..6300.

Therefore the divisors of 6300 are 1, 2, 3, 4, 5, 6, 7, 9, 10, 12,
14, 15, 18, 20, 21, 25, 28, 30, 35, 36, 42, 45, 50, 60, 63, 70, 75, 84,
90, 100, 105, 126, 140, 150, 175, 180, 210, 225, 252, 300, 315, 350,
420, 450, 525, 630, 700, 900, 1050, 1260, 1575, 2100, 3150, 6300.

(30)

$$\frac{2}{7} \text{ of } \frac{3}{8} \text{ of } 3\frac{1}{2} \text{ lbs.} = \frac{3}{8} \text{ lbs.,} \quad \frac{2}{7} \text{ of } \frac{3}{8} \text{ of } \frac{2}{7} \text{ of } \frac{1}{4} \text{ of } \$1 = \$\frac{3}{7},$$

$$\text{and } \frac{2}{7} \text{ of } \frac{1}{7} \text{ of } \frac{1}{10} \text{ of } \frac{2}{10} \text{ of } 90 \text{ lbs.} = \frac{1323}{1000} \text{ lbs.}$$

63

$$\begin{array}{l} \text{lbs.} \\ \frac{2}{7} : \frac{1323}{1000} :: \frac{2}{7} : \frac{2}{7} \times \frac{1323}{1000} = \frac{2}{7} \times \frac{1827}{2500} \times \frac{8}{7} = \frac{1827}{2500} = \$5 \cdot 04. \end{array}$$

ent by 1 and
x 2 = 48.

(31)

7 men will have 7 men's shares.

One woman has $\frac{2}{3}$ of a man's share; \therefore 2 women will have 2 $\times \frac{2}{3} = \frac{4}{3}$ of a man's share.

One child has $\frac{1}{3}$ of $\frac{2}{3} = \frac{2}{9}$ of a man's share; \therefore 11 children will have $11 \times \frac{2}{9} = \frac{22}{9}$ of a man's share.

7 men, 2 women and 11 children will have $7 + \frac{4}{3} + \frac{22}{9} = 8\frac{1}{3}$ men's shares.

$\$2739 \cdot 18 \div 8\frac{1}{3} = \$325 \cdot 99\frac{1}{3}$ = a man's share.

$\frac{2}{3}$ of $\$325 \cdot 99\frac{1}{3} = \$88 \cdot 90\frac{1}{3}$ = a woman's share.

$\frac{1}{3}$ of $\$88 \cdot 90\frac{1}{3} = \$29 \cdot 63\frac{1}{3}$ = a child's share.

(33)

(34)

	yds.	ft.	in.		
$\frac{1}{2}$ of $6\frac{1}{2}$ yds.	$= \frac{3}{2}$	yds.	$= 2 \ 2 \ 8$	$2 \ 28 : 7 \ 2$	}
$\frac{2}{3}$ of $\frac{1}{2}$ of $8\frac{1}{2}$ ft.	$= 1 \ 0 \ 0$			$4 : 11$	
$\frac{1}{3}$ of $\frac{1}{2}$ of $7\frac{1}{2}$ in.	$=$		3	$2 \ 8 : 5$	
			$13 : 11\frac{1}{2}$		
Sum	$= 3 \ 2 \ 8\frac{1}{2}$		$8\frac{1}{2} \ 88\frac{1}{2} : 3$		$= 104 : 5.$

(35)

23 bush. 2 pks. 1 gal. 1 qt. 1 pt. = 1515 pts.

$1515 \times 9000 \times \frac{1}{3} = 4545000$ in. = 71 miles 5 fur. 34 per. 3 yds.

(36)

$$\frac{4158}{10395} = \frac{462}{1155} = \frac{66}{165} = \frac{22}{55} = \frac{2}{5}.$$

(37)

VIII.

$\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{1}{5}$. Here the common denominator is $2 \times 3 \times 5 \times 7 = 322$. The numerators of the fractions are, for the first, $1 \times 3 \times 5 \times 7 = 151$; for the second, $2 \times 2 \times 5 \times 7 = 214$; for the third, $4 \times 2 \times 3 \times 7 = 250$; for the fourth, $2 \times 2 \times 3 \times 5 = 74$; and the equivalent fractions are, $\frac{151}{322}, \frac{214}{322}, \frac{250}{322}$ and $\frac{74}{322}$, which when added together = $\frac{685}{322} = 2\frac{3}{322}$, the numbers all through being in the octenary scale.

will have 2

11 children

$$1 + \frac{1}{4} = 8\frac{1}{4}$$

hare.

's share.

share.

$$= 104 : 5.$$

ts.

4 per. 3 yds.

$\frac{2}{3}$.

$$3 \times 5 \times 7$$

he first, 1 ×

$$= 214; \text{ for}$$

$$\times 2 \times 3 \times$$

$$14, \frac{340}{22} \text{ and}$$

he numbers

$$\begin{array}{lcl} 17 \text{ sheep} & = & 6 \text{ cows} \\ 26 \text{ cows} & = & 27\frac{1}{2} \text{ acres} \\ 12 \text{ acres} & = & 13 \text{ horses} \\ 11 \text{ horses} & = & 28 \text{ goats} \\ x \text{ goats} & = & 68 \text{ sheep} \end{array} \left\{ \begin{array}{l} \frac{3}{8} \times \frac{2\frac{1}{2}}{27\frac{1}{2}} \times \frac{13}{12} \times \frac{28}{11} \times \frac{17}{68} = \\ 2\frac{1}{2} \times 28 = 70 \text{ goats.} \end{array} \right.$$

$$\begin{array}{l} 27:54 \text{ days} \\ 24:18 \text{ cel.} \\ 36:48 \text{ ft. l.} \\ 21:28 \text{ ft.w.} \\ 10:9 \text{ ft. d.} \\ 3:5 \text{ hrs.} \end{array} \left\{ \begin{array}{l} :: 50 \text{ men} : \\ \frac{50 \times 54 \times 18 \times 48 \times 28 \times 9 \times 5}{27 \times 24 \times 36 \times 21 \times 10 \times 3} = 200 \text{ men.} \end{array} \right.$$

Page 226.

$$(7) \quad \$ \cdot 35 \times 92647 = \$32426 \cdot 45.$$

$$(8) \quad \begin{array}{l} \text{£} \quad \text{s.} \quad \text{d.} \\ 4746 \quad 17 \quad 0 = \text{cost of 94937 pails at 1s.} \\ 1582 \quad 5 \quad 8 = \text{" " " at 4d.} \\ 395 \quad 11 \quad 5 = \text{" " " at 1d.} \\ \hline \text{£}6724 \quad 14 \quad 1 = \text{cost of 94937 pails at 1s. 5d.} \end{array}$$

$$(9) \quad \$ \cdot 07\frac{1}{2} \times 95974 = \$7197 \cdot 90 \quad (10) \quad \$28 \cdot 80 \times 62 = \$1785 \cdot 60.$$

$$(11) \quad \$ \cdot 32\frac{1}{2} \times 2310 = \$750 \cdot 75. \quad (12) \quad \$ \cdot 37\frac{1}{2} \times 2117 = \$793 \cdot 87\frac{1}{2}.$$

$$(13) \quad \begin{array}{l} \text{£} \quad \text{s.} \quad \text{d.} \\ 375 \quad 6 \quad 0 = \text{price of 7506 pairs at 1s.} \\ 187 \quad 13 \quad 0 = \text{" " at 6d.} \\ 93 \quad 16 \quad 6 = \text{" " at 3d.} \\ 23 \quad 9 \quad 1\frac{1}{2} = \text{" " at 1\frac{1}{2}d.} \\ \hline \text{£}680 \quad 4 \quad 7\frac{1}{2} = \text{price of 7506 pairs at 1s. 9\frac{1}{2}d.} \end{array}$$

$$\begin{array}{cc} (14) & (15) \\ \$ \cdot 17\frac{1}{2} \times 1217 = \$212 \cdot 97\frac{1}{2}. & \$3 \cdot 07\frac{1}{2} \times 2103 = \$6466 \cdot 72\frac{1}{2}. \end{array}$$

		(16)	
10s.	$\frac{1}{2}$	2096	
		<u>3</u>	
		6288	0 0 = cost of 2096 oz. at £3.
5s.	$\frac{1}{2}$	1048	0 0 = " " at 0 10s.
2s. 6d.	$\frac{1}{2}$	524	0 0 = " " at 0 5s.
1s. 3d.	$\frac{1}{2}$	262	0 0 = " " at 0 2s. 6d.
1½d.	$\frac{1}{10}$	131	0 0 = " " at 0 1s. 3d.
		13	2 0 = " " at 0 0 1½d.
		<u>£8266</u>	2 0 = " " at £3 18s. 10½d.

10 dwt.	$\frac{1}{2}$	\$1.55	
		6	
		<hr/>	
		\$9.30	= cost of 6 oz.
5 dwt.	$\frac{1}{2}$	.77 $\frac{1}{2}$	= " 10 dwt.
2 dwt. 12 grs.	$\frac{1}{2}$	.38 $\frac{1}{2}$	= " 5 dwt.
1 dwt. 6 grs.	$\frac{1}{2}$	.19 $\frac{1}{2}$	= " 2 dwt. 12 grs.
2 grs.	$\frac{1}{16}$	.09 $\frac{1}{8}$	= " 1 dwt. 6 grs.
		.00 $\frac{3}{4}$	= " 2 grs.
		<hr/>	
		\$10.75 $\frac{3}{4}$	= cost of 6 oz. 18 dwt. 20 grs.

		(18)	
10s.	$\frac{1}{2}$	£98 0 0 = cost of 98 yards at £1.	
5s.	$\frac{1}{2}$	49 0 0 = " " " 0 10s.	
		24 10 0 = " " " 0 5s.	
		£171 10 0 = cost of 98 yards at £1 15s.	

2 qrs.	$\frac{1}{2}$	<u>£1 15</u>	
1 qr.	$\frac{1}{4}$	17 6	= cost of 2 qrs.
1 na.	$\frac{1}{8}$	8 9	= " 1 qr.
		2 2 $\frac{1}{2}$	= " 1 na.

$$\text{£1 } 8 \text{ } 5\frac{1}{4} = \text{cost of 3 qrs. 1 na.}$$

Then £171 10 0 = cost of 98 yards at £1 15s.

1 8 $5\frac{1}{2}$ = cost of 3 qrs. 1 na. at £1 15s. per yard.

£172 18 5½ = cost of 98 yds. 3 qrs. 1 na. at £1 15s per yd.

(19)

3.
0 10s.
0 5s.
0 2s. 6d.
0 1s. 3d.
0 0 1½d.

3 18s. 10½d.

grs.
g.

£1394 12 8 = rent of 344 acres at £4 ls. 1d.
 3 8 4½ = " 3 roods 15 per. at £4 ls. 1d. per ac.

 £1398 1 0½ = " 344 a. 3 r. 15 per. at £4 ls. 1d.

t. 20 grs.

(20)

5 dwt.	$\frac{1}{2}$	5 10		
		5		
1 dwt.	$\frac{1}{8}$	£1 9 2	=	price of 5 oz. at 5s. 10d. per oz.
12 grs.	$\frac{1}{4}$	1 5 $\frac{1}{2}$	=	5 dwt. " "
4 grs.	$\frac{1}{8}$	3 $\frac{1}{2}$	=	1 dwt. " "
1 gr.	$\frac{1}{16}$	1 $\frac{1}{2}$	=	12 grs. " "
		0 $\frac{7}{8}$	=	4 grs. " "
		0 $\frac{7}{8}$	=	1 gr. " "
		£1 11 1 $\frac{1}{8}$	=	5 oz. 6 dwt. 17 grs. at 5s. 10d. per oz.

per yard.

1 15s per yd,

(21)

2 grs.	$\frac{1}{2}$	£1 2 4			
		4			
		£4 9 4	=	price of 4 yards at £1 2 4 per yard.	
2 na.	$\frac{1}{2}$	11 2	=	" 2 qrs.	" "
1 na.	$\frac{1}{2}$	2 9 $\frac{1}{2}$	=	" 2 na.	" "
		1 4 $\frac{1}{2}$	=	" 1 na.	" "
		£5 4 8 $\frac{1}{2}$	=	price of 4 yds. 2 qrs. 3 na.	" "

(22)

1 rood	$\frac{1}{4}$	£1 16			
		32			
		£57 12 0	=	price of 32 acres at £1 16s.	
10 per.	$\frac{1}{4}$	9 0	=	" 1 rood.	"
2 per.	$\frac{1}{4}$	2 3	=	" 10 per.	"
2 per.	$\frac{1}{4}$	5 $\frac{1}{2}$	=	" 2 per.	"
		5 $\frac{1}{2}$	=	" 2 per.	"
		£58 4 1 $\frac{1}{2}$	=	price of 32 acres 1 rood 14 per.	

(23)

4 pts.	$\frac{1}{2}$	7 6			
		3			
		£1 2 6	=	price of 3 gals. at 7s.6d. per gal.	
1 pt.	$\frac{1}{2}$	3 9	=	" 4 pts.	"
		11 $\frac{1}{2}$	=	" 1 pt.	"
		£1 7 2 $\frac{1}{2}$	=	price of 3 gals. 5 pts.	

(24)

$$\$1.67\frac{1}{2} \times 724 = \$1212.70.$$

(25)

$$\$1.93\frac{1}{2} \times 721 = \$1396.93\frac{1}{2}.$$

(28)

10s.	1	4514	(26)	
		2		
		<hr/>		
6s. 8d.	1	£9028 0 0	=	cost of 4514 rods at £2
10d.	1	2257 0 0	=	" " at 0 10
1d.	10	1504 13 4	=	" " at 0 6 8
1d.	1	188 1 8	=	" " at 0 0 10
		18 16 2	=	" " at 0 0 1
		9 8 1	=	" " at 0 0 0 1
		<hr/>		
		£13005 19 3	=	" " at £2 17 7 1

(27)

10s.	1	3749 7 6	(27)
		3	
		<hr/>	
		£11248 2 6	= price of 3749½ acres at £3
5s.	1	1874 13 9	= " " at 0 10
6d.	10	937 6 10½	= " " at 0 5
		93 14 8½	= " " at 0 0 6
		<hr/>	
		£14153 17 9½	= price of 3749½ acres at £3 15 6

(28)

4s.	$\frac{1}{8}$	£17	0	0	= cost of 17 cwt. at £1		
8d.	$\frac{1}{4}$	3	8	0	=	"	at 0 4
1d.	$\frac{1}{8}$	11	4	=	"	"	at 0 0 8
		1	5	=	"	"	at 0 0 1
		£21	0	9	= cost of 17 cwt. at £1	4	9

$\pounds 21 \ 0 \ 9 = \text{cost of 17 cwt. at } \pounds 1 \ 4 \ 9$

1 qr.	$\frac{1}{4}$	£1 4 9	
16 lbs.	$\frac{1}{8}$	6 2½	= cost of 1 qr.
1 lb.	$\frac{1}{16}$	3 6½	= " 16 lbs.
		0 2 7½	= " 1 lb.

$$9 \text{ } 11 \frac{37}{119} = \quad \text{“} \quad 1 \text{ qr. } 17 \text{ lbs.}$$

£21 0 9 = cost of 17 cwt. at 1 qr. 17 lbs.
 9 11 ³⁷/₁₁₂ = " 1 qr. 17 lbs. £1 4s. 9d. per cwt.

$\pounds 21\ 10\ 8\frac{37}{112} =$ " 17cwt. 1qr. 17lbs. " "

(29)

2 qrs.	1	\$11.55			
		78			
		<hr/>			
		9240			
		8085			
		<hr/>			
		\$900.90	= cost of 78 cwt. at \$11.55 per cwt.		
1 qr.	1	5.77½	=	"	2 qrs.
7 lbs.	1	2.88½	=	"	1 qr.
4 lbs.	1	1.72½	=	"	7 lbs.
1 lb.	1	.41½	=	"	4 lbs.
		<hr/>			
		10.18	=	"	1 lb.
		<hr/>			
		\$910.80	= cost of 78 cwt. 3 qrs. 12 lbs.		

(30)

£10 10
20

£210 0 = price of 20 tons at £10 10s.

19 cwt. 3 qrs. 27½ lbs. = 1 ton — ½ lb. The price of 1 ton is £10 10s., and the price of ½ lb. = $\frac{1}{4480}$ of £10 10s. = $\frac{1}{112}$ d. ∴ the price of 19 cwt. 3 qrs. 27½ lbs. = £10 10s. — $\frac{1}{112}$ d. = £10 9s. 11 $\frac{1}{112}$ d.

£210 0 0 = price of 20 tons at £10 10s.

10 9 11 $\frac{1}{112}$ = " 19 cwt. 3 qrs. 27½ lbs.

£220 9 11 $\frac{1}{112}$ = price of 20 tons 19 cwt. 3 qrs. 27½ lbs. at £10 10s. per ton,

10 cwt.	$\frac{1}{2}$	\$45.50	(31)
		219	
		40950	
		4550	
		9100	
		\$9964.50 = price of 219 tons at \$45.50 per ton.	
5 cwt.	$\frac{1}{2}$	22.75 =	" 10 cwt. " "
1 cwt.	$\frac{1}{2}$	11.37 $\frac{1}{2}$ =	" 5 cwt. " "
2 qrs.	$\frac{1}{2}$	2.27 $\frac{1}{2}$ =	" 1 cwt. " "
1 qr.	$\frac{1}{2}$	1.13 $\frac{1}{2}$ =	" 2 qrs. " "
		.56 $\frac{1}{2}$ =	" 1 qr. " "
		\$10002.60 $\frac{1}{2}$ = price of 219 tons 16 cwt. 3 qrs.	

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BILLS OF PARCELS.

(No. 2.)

	s.	d.	£	s.	d.	
9 pair of worsted stockings, at.....	4	6	per pair	2	0	6
6 pair of silk ditto, at	15	9	"	4	14	6
17 pair of thread ditto, at.....	5	4	"	4	10	8
23 pair of cotton ditto, at.....	4	10	"	5	11	2
14 pair of yarn ditto, at	2	4	"	1	12	8
18 pair of women's silk gloves, at...	4	2	"	3	15	0
19 yards of flannel, at	1	7½	per yard	1	10	10½

Ans. £23 15 4 $\frac{1}{2}$

(No. 3.)

75 $\frac{1}{2}$ lbs. of sugar, at.....	7 $\frac{1}{2}$ cents per lb.	\$5.85 $\frac{1}{2}$
63 lbs. of tea, at.....	93	" 58.59
126 lbs. of butter, at.....	13	" 16.38
35 $\frac{1}{2}$ lbs. of raisins, at	18 $\frac{1}{2}$	" 6.71 $\frac{1}{2}$
17 lbs. of sago, at	15	" 2.55
23 lbs. of rice, at	9	" 2.07
58 $\frac{1}{2}$ lbs. of starch, at.....	22	" 12.87

Ans. \$105.02 $\frac{1}{2}$

(No. 4.)

198 Sangster's National Arithmetic, at.....	\$0.60	\$118.80
197 Robertson's Philosophy of Grammar, at ...	0.50	98.50
83 Hodgins' Geography, at	1.00	83.00
57 Sangster's Algebraic Formula, at	0.12½	7.12½
217 Strachan's Canadian Penmanship, at.....	0.37½	81.37½
143 Hodgins' Geography of British Provinces, at	0.45	64.35
227 Sangster's First Arithmetic, at.....	0.30	68.10

Ans. \$521.25

(No. 5.)

	s.	d.	£	s.	d.
9½ yards of silk, at	12	9 per yard	6	1	1½
13 yards of flowered ditto, at...15	6	"	10	1	6
11½ yards of lustring, at.....	6	10	4	0	3½
14 yards of brocade, at.....11	3	"	7	17	6
12½ yards of satin, at	10	8	6	10	8
11½ yards of velvet, at	18	0	10	4	9

Ans. £44 15 10

(No. 6.)

14 oz. ipecacuanha, at	0.67	9.38
23 " laudanum, at.....	0.89	20.47
17 " emetic tartar, at.....	1.25	21.25
25 " cantharides, at	2.17	54.25
27 " gum mastic, at	0.61	16.47
56 " gum camphor, at	0.27	15.12

Ans. \$136.94

(No. 7.)

	s.	d.	£	s.	d.
15½ lbs. of currants, at	0	4 per lb.	5	2	
17½ lbs. of Malaga raisins, at.....	0	5½ "	7	10½	
19½ lbs. of sun raisins, at	0	6 "	9	10½	
17 lbs. of rice, at	0	3½ "	4	11½	
8½ lbs. of pepper, at.....	1	6 "	12	9	
3 loaves of sugar, weight 32½ lbs. at.	0	8½ "	1	3	0½
13 oz. of cloves, at.....	0	9 per oz.	9	9	

Ans. £3 13 5

$$427.1 \div .0000637 = 427100000 \div 637 = 6704866.561 +.$$

£	s.	d.
b.	5	2
	7	10 ⁷ / ₈
	9	10 ¹ / ₂
	4	11 ¹ / ₂
	12	9
1	3	0 ¹ / ₂
oz.	9	9
<hr/>		
£3	13	5

10s.	1	£19						
		19						
		171						
		19						
		£361	0	0	=	cost of 19 tons at £19		
5s.	1	9	10	0	=	"	"	
4s.	1	4	15	0	=	"	"	at 0 10
6d.	1	3	16	0	=	"	"	at 0 5
3d.	1	9	6	=	"	"	at 0 4	
2d.	1	4	9	=	"	"	at 0 0 6	
1d.	1	3	2	=	"	"	at 0 0 3	
1d.	1	9	=	"	"	at 0 0 2		
		4	=	"	"	at 0 0 0		
		£379	19	71	=	cost of 19 tons at £19		

£379 19 7½ = cost of 19 tons at £19 19 11½
 gross 271 lbs

$19 \text{ cwt. } 3 \text{ qrs. } 27\frac{1}{2} \text{ lbs.} = 1 \text{ ton} - \frac{1}{2} \text{ lb.}$ The price of 1 ton is
 $\pounds 19 \text{ } 19\text{s. } 11\text{d.}$, and the cost of $\frac{1}{2} \text{ lb.} = \frac{1}{4480}$ of $\pounds 19 \text{ } 19\text{s. } 11\text{d.}$
 $= 1\frac{1}{2}\text{d.}$; \therefore the cost of $19 \text{ cwt. } 3 \text{ qrs. } 27\frac{1}{2} \text{ lbs.} = \pounds 19 \text{ } 19\text{s. } 11\text{d.}$
 $- 1\frac{1}{2}\text{d.} = \pounds 19\text{s. } 19\text{s. } 10\frac{1}{2}\text{d.}$
 $\pounds 379 \text{ } 19 \text{ } 7\frac{1}{2} = \text{cost of } 19 \text{ tons.}$

$\begin{array}{r} \text{£379 } 19 \text{ } 7\frac{1}{2} \\ \underline{\text{19 } 19 \text{ } 10\frac{1}{2}} \end{array}$
 $\begin{array}{r} \text{17920.} \\ \text{17920} \end{array}$
 $\begin{array}{r} = \\ = \end{array}$
 $\begin{array}{r} \text{£198. } 198. \text{ } 10\frac{1}{2} \\ \text{cost of 19 tons.} \end{array}$

$\begin{array}{r} \text{£399 } 19 \text{ } 5\frac{1}{2} \\ \underline{\text{17920}} \end{array}$
 $\begin{array}{r} \text{17920} \\ \text{17920} \end{array}$
 $\begin{array}{r} = \\ = \end{array}$
 $\begin{array}{r} \text{19 cwt. 3 qrs. } 27\frac{1}{2} \text{ lbs.} \\ \text{19 tons 19 cwt. 3 qrs. } 27\frac{1}{2} \text{ lbs.} \end{array}$

(4)

Dissimilar.		Similar.		Similar and Coterminous.
73·723	=	73·723723	=	73·723723723
11·342	=	11·3422	=	11·342222222
16·713	=	16·7130	=	16·713000000
19·034	=	19·034034	=	19·034034034
713·213437	=	713·213437	=	713·213437213
12·345678	=	12·345678345	=	12·345678345
				2 carried.
		Sum	=	846·372095763

(5)

$$\begin{array}{l}
 5:7 = 5 \div 7 = .714 + \\
 9:13 = 9 \div 13 = .692 + \\
 12:17 = 12 \div 17 = .705 + \\
 7:10 = 7 \div 10 = .7
 \end{array}
 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \text{Hence } 5:7 \text{ is the greatest,} \\ \text{and } 9:13 \text{ least.} \end{array}$$

$$\frac{5}{7} \times \frac{9}{13} \times \frac{12}{17} \times \frac{7}{10} = \frac{54}{221} = 54:221.$$

(6)

1 acre = 160 rods, and 25 acres 2 roods 35 rods = 4115 rods.

$$\begin{array}{r}
 \text{rods.} \quad 40 \cdot 25 \quad 83 \\
 160:4115:\$80 \cdot 50 : \frac{80 \cdot 50 \times 415}{160} = \$2070 \cdot 3593.
 \end{array}$$

(8)

$$\$3 \cdot 68\frac{1}{2} \times 7439 = \$27431 \cdot 31\frac{1}{2}.$$

Coterminous.

23723

22222

00000

34034

37213

78345

2 carried.

95763

he greatest,

st.

: 221.

= 4115 rods.

70-3593.

(9)

~~135795~~. The G. C. M. of 135795 and 222210 is 12345; when both terms of the fraction are divided by 12345, it becomes $\frac{1}{1}$.

~~714235~~. Here 714235 and 999999 have no G. C. M.; \therefore the fraction cannot be reduced.

~~109375~~. The G. C. M. of 109375 and 100000 is 3125; when both terms of the fraction are divided by 3125, it becomes reduced to $\frac{3}{4}$.

~~20301~~. The G. C. M. of 20301 and 33633 is 303; when both terms of the fraction are divided by 303, it is reduced to its lowest terms, viz., $\frac{67}{111}$.

(10)

34½ bushels turnips	= 17 bushels potatoes	}	=
9 " potatoes	= 59½ lbs. tea		
6 lbs. tea	= 11½ stone flour		
13 stone flour	= 360 cents		
38 cents	= 12 loaves		
119 loaves	= x bushels turnips		

$$\frac{3}{17} \times \frac{8}{59\frac{1}{2}} \times \frac{8}{11\frac{1}{2}} \times \frac{13}{360} \times \frac{19}{88} \times \frac{7}{119} = \frac{3 \times 13 \times 19}{8\frac{1}{2} \times 40} = 2\frac{61}{40}.$$

(11)

54 : 27 men	}	:: 7 days :	$\frac{7 \times 27 \times 8 \times 77 \times 24 \times 22 \times 5}{54 \times 11 \times 42 \times 20 \times 16 \times 3}$
11 : 8 hours			
42 : 77 floors			
20 : 24 feet long			
16 : 22 feet wide			
3 : 5 coats paint			

$$= \frac{7 \times 11}{2 \times 3} = 12\frac{1}{2} \text{ days.}$$

(13)

IX.	IX.	IX.
<u>12)72342</u>	<u>6)72342</u>	<u>3)72342</u>
12)5403..2	6)11806..2	3)23713..2
<u>12)407..0</u>	<u>6)1731..0</u>	<u>3)7234..0</u>
12)30..7	6)264..4	3)2371..1
<u>2..3</u>	<u>6)40..4</u>	<u>3)723..1</u>
	6)6..0	3)237..0
	<u>1..0</u>	<u>3)72..1</u>
		3)23..2
		<u>3)7..0</u>
		<u>2..1</u>

IX.	XII.	VI.	III.
72342	= 23702	= 1004402	= 2102101102
<u>9</u>	<u>12</u>	<u>6</u>	<u>3</u>
65	27	6	7
<u>9</u>	<u>12</u>	<u>6</u>	<u>3</u>
588	331	36	21
<u>9</u>	<u>12</u>	<u>6</u>	<u>3</u>
5296	3972	220	65 1765
<u>9</u>	<u>12</u>	<u>6</u>	<u>3</u> 3
47666	47666	1324	196 5296
		<u>6</u>	<u>3</u> 3
		7944	588 15888
		<u>6</u>	<u>3</u> 3
		47666	1765 47666

(14)

IX.

72342
23713..2
3)7234..0
3)2371..1
3)723..1
3)237..0
3)72..1
3)23..2
3)7..0
2..1

II.

111111
2
3
2
7
2
15
2
31
2
63 Greatest.

II.

100000
2
2
2
4
2
8
2
16
2
32 Least.

IV.

333333
4
15
4
63
4
255
4
1023
4
4095 Greatest.

IV.

100000
4
4
4
16
4
64
4
256
4
1024 Least.

III.

2102101102
3
7
3
21
3
65 1765
3 3
196 5296
3 3
588 15888
3 3
765 47666

VI.

555555
6
35
6
215
6
1295
6
7775
6
46655 Greatest.

VI.

100000
6
6
6
36
6
216
6
1296
6
7776 Least.

VIII.

777777
8
63
8
511
8
4095
8
32767
8
262143 Greatest.

VIII.

100000
8
8
8
64
8
512
8
4096
8
32768 Least.

(Continued on next page.)

(17)

Dissimilar.		Similar.		Similar and Coterminous.
97-91342	=	97-913423	=	97-913423423423423
18-1234567	=	19-1234567	=	18-123456745674567
		Difference	=	18-789966677748855

(18)

$$\begin{array}{r}
 20 \text{ ft. } 7' \\
 19 \text{ ft. } 5' \quad 7'' \\
 \hline
 1 \quad 0 \quad 0 \quad 1''' \\
 8 \quad 6 \quad 11 \\
 391 \quad 1 \\
 \hline
 400 \quad 7 \quad 11 \quad 1 = 44 \text{ sq. yds.} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} = \\
 44.8888 \text{ sq. yds.} = 44.517 + \text{sq. yds.} \\
 \$2.87\frac{1}{2} \times 44.517 = \$127.98 +.
 \end{array}$$

(19)

$$\begin{aligned}
 916 \text{ acres } 3 \text{ roods } 17 \text{ per } 7 \text{ yds.} &= 4437591\frac{1}{2} \text{ sq. yds., and } 42 \\
 \text{acres } 1 \text{ rood } 2 \text{ per } 17 \text{ yds.} &= 209407\frac{1}{2} \text{ sq. yds.} \\
 4437591\frac{1}{2} \div 209407\frac{1}{2} &= 4437591.25 \div 207407.5 = 21.19117+.
 \end{aligned}$$

Page 233.

(14)

(15)

$$\$742.10 \times .05 = \$37.10\frac{1}{2}. \quad \$1000 \times .11 = \$110.$$

(16)

$$\$734.19 \times .10 = \$73.419.$$

(17)

$$\$1624.50 \times .875 = \$1421.4375.$$

(18)

$$\$994.70 \times .125 = \$124.3375.$$

(19)

$$\$777.50 \times .0875 = \$68.03125, \text{ or } \$68.03\frac{1}{2}.$$

(20)

$$\$7135.80 \times .0225 = \$160.5555.$$

(21)

$$2740 \times .20 = 548.$$

(22)

$$\$7490 \times .10 = \$749$$

$$\$7490 \times .17 = \$1273.30$$

$$\$7490 \times .27 = \$2022.30$$

$$\$7490 \times .46 = \$4445.40$$

(23)

$$\$740 \times .045 = \$33.30$$

$$\$1680 \times .025 = \$42.00$$

$$\$42.00 - \$33.30 = \$8.70$$

(24)

$$729 \times .11 = 80.19$$

$$729 - 80.19 = 648.81 = 648\frac{81}{100}$$

$$\$763.22 \times 25 = \$190.8050$$

$$\$847.16 \times .16 = 135.5456$$

$$\$1234.17 \times .0625 = 77.135625$$

$$\text{Sum} = \$403.486225$$

(26)

$$\$17429.40 \times .43 = \$7494.64\frac{1}{2}$$

$$\$17429.40 \times .37 = 6448.87\frac{1}{2}$$

$$\$13943.52$$

$$\$17429.40 - \$13943.52 = \$3485.88.$$

(27)

$$68978 \times .36 = 24832.08.$$

(28)

$$29800 \times .17 = 5066$$

$$29800 - 5066 = 24734$$

 Page 235.

(8)

$$\$1000 \times .045 = \$45.$$

(4)

$$\$1678.30 \times .0225 = \$37.76175.$$

(5)

(6)

$$\begin{aligned} \$7531.19 \times .0375 &= \$282.419625. & \$508.60 \times .0125 &= \$6.3575 \end{aligned}$$

(7)

(8)

$$\begin{aligned} \$7863.50 \times .0175 &= \$137.61125. & \$878.30 \times .025 &= \$21.9575 \end{aligned}$$

(9)

(10)

$$\begin{aligned} \$7193.16 \times .03125 &= \$224.78625. & \$6734.10 \times .17 &= \$1144.797. \end{aligned}$$

(11)

$$\$7.13 \times 718 \div .0425 = \$217.57195.$$

(12)

$$\$1.85 \times 8243 \times .05625 = \$857.7871875.$$

 Page 236.

(13)

(14)

$$\$7893.87 \times .02 = \$157.8774.$$

$$\$8000 \times .00875 = \$70.$$

(15.)

$$\$8643.22 \times .0125 = \$108.04025.$$

(16.)

$$\$78963.80 \times .00875 = \$690.93325.$$

(17)

$$\$1987.27 \times .0375 = \$74.522625.$$

Page 237.

(19)

$$\begin{aligned} \$4000 \div 1.0125 &= \$3950.61728 + = \text{sum to be invested.} \\ \$4000 - 3950.61728 &= \$49.38271 = \text{commission.} \end{aligned}$$

(20)

$$\begin{aligned} \$7500 \div 1.045 &= \$7177.03349 = \text{sum to be expended in laces.} \\ \$7500 - \$322.96651 &= \$322.96651 = \text{commission.} \end{aligned}$$

(21)

$$\begin{aligned} \$8470 \div 1.05 &= \$8066.66\frac{2}{3} = \text{sum to be invested.} \\ \$8066.66\frac{2}{3} \div \$6.40 &= 1260\frac{1}{4} \text{ Ans.} \end{aligned}$$

(22)

$$\$11000 \div 1.00875 = \$10904.584882 = \text{sum to be invested.}$$

(23)

$$\begin{aligned} \$13000 \div 1.045 &= \$12440.1913 + = \text{sum to be invested.} \\ \$13000 - \$12440.1913 &= \$559.8086 + = \text{commission.} \\ \$12440.1913 + \div \$9.63 &= 3427.0499 \text{ yds. Ans.} \end{aligned}$$

Page 238.

(4)

(5)

$$\$9000 \div 0.83 = \$10843.373. \quad \$8500 \div 1.11 = \$7657.6576.$$

(6)

$$\begin{aligned} \$17500 \div 1.0125 &= \$17283.951 = \text{amount to be invested.} \\ \$17283.951 \div 1.07 &= \$16153.22 = \text{stock.} \end{aligned}$$

(7)

$$\begin{aligned} \$20000 \div 1.0175 &= \$19656.61965 = \text{amount to be invested.} \\ \$19656.61985 \div 0.97 &= \$20263.937 = \text{stock remitted.} \end{aligned}$$

(8)

$$\begin{aligned} \$200 \times 100 &= \$20000 = \text{par value of 200 shares.} \\ \$1 \text{ stock costs } \$1.055, & \$1.055 \times 20000 = \$21100 = \text{cost of stock.} \\ \$21100 \times .00875 &= \$184.625 = \text{brokerage.} \\ \$21100 + \$184.625 &= \$21284.625 = \text{whole cost.} \end{aligned}$$

Page 240.

(2)

$$\$7500 \times .0175 = \$131.25.$$

(3)

$$\$8375 \times .0075 = \$62.8125.$$

(4)

$$\$6000 \times .01875 = \$112.50.$$

(5)

$$\$5000 \times .0117 = \$58.50.$$

(6)

$$\$6400 \times .0090 = \$57.60.$$

(7)

$$\$4500 \times .0035 = \$15.75.$$

(8)

$$\$36000 \times .03 = \$1080.$$

(9)

$$\$27000 \times 4.82 \times 4 = \$5205.60.$$

(10)

$$\$39000 \times .022 = \$858.$$

(11)

$$\$17800 \times .005 = \$89.$$

(12)

$$\$12350 \times .017 \times 7 = \$1235.$$

Page 241.

(15)

$$\$17000 \div .965 = \$17616.58.$$

(16)

$$\$22750 \div .94 = \$24202.127.$$

(17)

$$\$15000 \div .9775 = \$15345.2685.$$

(18)

$$\$33000 \div .9425 = \$35013.2625.$$

Page 243.

(3)

$$1347 \times 5 = 6735 \text{ lbs.} = \text{gross weight.}$$

$$6735 \times .06 = 404.1 \text{ lbs. tare.}$$

$$\begin{aligned} 6330.9 \text{ lbs.} &= \text{net at } 3\frac{1}{2} \text{ cents per lb.} = 6330.9 \\ &\times 3\frac{1}{2} = \$221.58. \end{aligned}$$

(4)

$$127 \times 11 = 1397 \text{ lbs.} = \text{gross weight.}$$

$$1397 \times .03 = 41.91 \text{ lbs.} = \text{tare.}$$

$$\begin{aligned} 1355.09 \text{ lbs.} &= \text{net at } \$0.12 \text{ per lb.} = 1355.09 \\ &\times .012 = \$16.26. \end{aligned}$$

(5)

$$129 \times .13 = \$16.77.$$

(6)

$$31 \times 207 = 6417 \text{ lbs.} = \text{gross weight.}$$

$$207 \times 2\frac{1}{2} = 465\frac{1}{2} \text{ lbs.} = \text{tare.}$$

$$\begin{aligned} 5951\frac{1}{2} \text{ lbs.} &= \text{net at } 5\frac{1}{2} \text{ cents per lb.} = 5951\frac{1}{2} \times \\ &5\frac{1}{2} = \$342.1968. \end{aligned}$$

(7)

$$214 \times .47 = \$100.58.$$

\$24202.127.

(10)

(11)

$$\$17429.80 \times .21 = \$3660.2580. \quad \$2920.16 \times .075 = \$219.012.$$

\$35013.2625.

(12)

(13)

$$\$71342.90 \times .25 = \$17835.725. \quad \$913.73 \times .2 = \$182.746.$$

(14)

$$\$14713.19 \times .33 = \$4855.3527.$$

lb. = 6330.9

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(2)

$$\begin{aligned} \$23900 \div 7142300 &= \$0.0033462 = \text{rate per dollar.} \\ \$0.0033462 \times 14729.50 &= \$49.2878 \text{ +. } \textit{Ans.} \end{aligned}$$

d. = 1355.09

(3)

$$\begin{aligned} \$100000 \div 5793000 &= \$0.017262 = \text{rate per dollar.} \\ \$0.017262 \times 18600 &= \$321.0732. \textit{Ans.} \end{aligned}$$

(4)

$$\begin{aligned} \$100000 \div 5793000 &= \$0.017262 = \text{rate per dollar.} \\ \$0.017262 \times 7500 &= \$129.465. \textit{Ans.} \end{aligned}$$

(5)

$$\begin{aligned} \$100000 \div 5793000 &= \$0.017262 = \text{rate per dollar.} \\ \$0.017262 \times 11400 &= \$196.7868. \textit{Ans.} \end{aligned}$$

= 5951\frac{1}{2} \times

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(13)

Here $P = \$723.19$, $r = .067$, and $t = 7.32$.Then $I = Prt = 723.19 \times .067 \times 7.32 = \354.6813036 .

(14)

Here $P = \$857.19$, $r = .065$, and $t = 6\frac{1}{2}$ or 6.5 .Then $A = P(1 + rt) = \$857.19 \times 1.4225 = \1219.352775 .

(15)

Here $t = 11$, and $r = .725$.Then $n = tr + 1 = 11 \times .725 + 1 = 8.975$.

(16)

Here $P = \$654.32$, $I = \$234.56$, and $r = .07$.
$$\text{Then } t = \frac{I}{Pr} = \frac{234.56}{654.32 \times .07} = 5.12112 \text{ or } 5 \text{ years } 1 \text{ m. } 13 \text{ d.}$$

(17)

Here $A = \$1200$, $P = \$700$, and $t = 5$.
$$\text{Then } r = \frac{A - P}{Pt} = \frac{1200 - 700}{700 \times 5} = \frac{1}{7} = \text{rate per unit } \therefore 14\frac{2}{7} = \text{rate per cent.}$$

(18)

Here $n = 4$, and $r = .23$.
$$\text{Then } t = \frac{n-1}{2r} = \frac{4-1}{2 \times .23} = 13 \text{ years } 15 \text{ days.}$$

(19)

Here $P = \$270$, $I = \$87$, and $r = .07$.
$$\text{Then } t = \frac{I}{Pr} = \frac{87}{270 \times .07} = 4 \text{ years } 7\frac{1}{11} \text{ months,}$$

(20)

Here $P = \$680$, $t = 11\frac{1}{2}$, and $r = .11$.Then $A = P(1 + rt) = 680 \times 2.265 = \1540.20 .

(21)

Here $A = \$2000$, $t = 20$, and $r = .08$.Then $P = \frac{A}{1 + rt} = \frac{2000}{2.6} = \$769.23\frac{1}{2}$.

(22)

Here $n = 21$, and $t = 24$.Then $r = \frac{n-1}{t} = \frac{21-1}{24} = .83\frac{1}{3} = \text{rate per unit. } \therefore 83\frac{1}{3} =$
rate per cent.

(23)

* Here $n = 23$, and $r = .16$.Then $t = \frac{n-1}{r} = \frac{23-1}{.16} = 137\frac{1}{2} \text{ years.}$

(24)

Here $P = \$679.18$, $r = .0775$, and $t = 11.73$.Then $I = Prt = 679.18 \times .0775 \times 11.73 = \617.4255 .

(25)

Here $P = \$950$, $A = \$1763.42$, and $t = 10$.Then $r = \frac{A - P}{Pt} = \frac{1763.42 - 950}{950 \times 10} = .08562 = \text{rate per unit}$ $\therefore 8.562 = \text{rate per cent.}$

(26)

Here $P = \$666$, $A = \$1347.50$, and $r = .06$.

$$\text{Then } t = \frac{A - P}{Pr} = \frac{1347.50 - 666}{666 \times .06} = 17.054+ \text{ years, or 17 years 19 days.}$$

(27)

Here $P = \$273$, $I = \$100$, and $r = .09$.

$$\text{Then } t = \frac{I}{Pr} = \frac{100}{273 \times .09} = 4.07 \text{ years} = 4 \text{ years 25 days.}$$

(28)

Here $P = \$476.30$, $A = \$500$, and $t = 2$.

$$\text{Then } r = \frac{A - P}{Pt} = \frac{500 - 476.30}{476.30 \times 2} = .0248 = \text{rate per unit.}$$

$\therefore 2\frac{1}{2}\% = \text{rate per cent.}$

(29)

Here $P = \$749.49$, $I = \$257$, and $t = 7$.

$$\text{Then } r = \frac{I}{Pt} = \frac{257}{749.49 \times 7} = .04898 = \text{rate per unit.}$$

$\therefore 4.898\% = \text{rate per cent.}$

(30)

Here $A = \$1111.11$, $t = 11$, and $r = .11$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1111.11}{2.21} = \$502.7647.$$

(31)

 $P = £167.47$, $r = .11$, and $t = 9$.

$$I = Prt = 167.47 \times .11 \times 9 = £165.7953 = £165 \text{ ls. } 10\frac{1}{2}\text{d.}$$

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(34)

$$11 \div 2 = 5\frac{1}{2} \text{ cents.}$$

(35)

$$16 \div 2 = 8 \text{ cents} = \$0.08.$$

(36)

$$9 \text{ years and 8 months} = 116 \text{ months, and } 116 \div 2 = 58 \text{ cents} = \$0.58.$$

(37)

$$16 \text{ years and 3 months} = 195 \text{ months, and } 195 \div 2 = 97\frac{1}{2} \text{ cents} = \$0.97\frac{1}{2}.$$

(38)

$$11 \text{ years and 7 months} = 139 \text{ months, and } 139 \div 2 = 69\frac{1}{2} \text{ cents} = \$0.695.$$

(39)

$$12 \text{ years and 5 months} = 149 \text{ months, and } 149 \div 2 = 74\frac{1}{2} \text{ cents} = \$0.745.$$

(40)

$$3 \text{ years and 2 months} = 38 \text{ months, and } 38 \div 2 = 19 \text{ cents} = \text{interest of } \$1 \text{ for given rate and time.}$$

$$\$0.19 \times 279.40 = \$53.086.$$

(41)

$$6 \text{ years and 7 months} = 79 \text{ months, and } 79 \div 2 = 39\frac{1}{2} \text{ cents} = \text{interest of } \$1 \text{ for given rate and time.}$$

$$\$0.395 \times 189.70 = \$74.9315.$$

(42)

8 years and 11 months = 47 months, and $47 \div 2 = 23\frac{1}{2}$ cents =
interest of \$1 for given rate and time.

$$\$0.235 \times 1463 = \$343.805.$$

(43)

11 years and 1 month = 133 months, and $133 \div 2 = 66\frac{1}{2}$ cents =
interest of \$1 for given rate and time.

$$\$0.665 \times 28967.50 = \$19263.3875.$$

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(45)

$$2 \div 6 = \frac{1}{3} \text{ mill} = \$0.000\bar{3}.$$

(46)

$$7 \div 6 = 1\frac{1}{6} \text{ mills} = \$0.001\bar{6}.$$

(47)

$$11 \div 6 = 1\frac{5}{6} \text{ mills} = \$0.001\bar{8}.$$

(48)

$$27 \div 6 = 4\frac{1}{2} \text{ mills} = \$0.004\bar{5}.$$

(49)

$$47 \div 6 = 7\frac{5}{6} \text{ mills} = \$0.007\bar{8}.$$

(50)

$$8 \div 2 = 4 \text{ cents} = \$0.04.$$

$$12 \div 6 = 2 \text{ mills} = \$0.002 \text{ and } \$0.04 + \$0.002 = \$0.042.$$

(51)

$$66 \div 6 = 11 \text{ mills} = \$0.011.$$

(52)

$$2 \text{ years } 2 \text{ m'ths} = 26 \text{ months, and } 26 \div 2 = 13 \text{ cents} = \$0.13.$$

$$19 \div 6 = 3\frac{1}{6} \text{ mills} = \$0.003\bar{3} \text{ and } \$0.13 + \$0.003\bar{3} = \$0.133\bar{3}.$$

$$= 23\frac{1}{2} \text{ cents} =$$

$$7 \text{ years } 8 \text{ m'ths} = 92 \text{ months, and } 92 \div 2 = 46 \text{ cents} = \$0.46.$$

$$9 \div 6 = 1\frac{1}{2} \text{ mills} = \$0.001\frac{1}{2} \text{ and } \$0.46 + \$0.001\frac{1}{2} = \$0.461\frac{1}{2}.$$

(54)

$$= 66\frac{1}{2} \text{ cents} =$$

$$17 \text{ years } 11 \text{ months} = 215 \text{ months, and } 215 \div 2 = 107\frac{1}{2} \text{ cents} =$$

$$\$1.075.$$

$$23 \div 6 = 3\frac{5}{6} \text{ mills} = \$0.003\frac{5}{6}, \text{ and } \$1.075 + \$0.003\frac{5}{6} = \$1.078\frac{5}{6}.$$

(55)

$$12 \text{ years } 7 \text{ months} = 151 \text{ months, and } 151 \div 2 = 75\frac{1}{2} \text{ cents} =$$

$$\$0.755.$$

$$17 \div 6 = 2\frac{5}{6} \text{ mills} = \$0.002\frac{5}{6}, \text{ and } \$0.755 + \$0.002\frac{5}{6} = \$0.757\frac{5}{6}.$$

$$6) \\ s = \$0.001\frac{1}{2}.$$

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(57)

$$s = \$0.004\frac{1}{2}.$$

Interest on \$1 for 7 months	=	\$0.035
Interest on \$1 for 17 days	=	<u>2\frac{5}{8}</u>

$$\text{Therefore interest on $1 for 7 months 17 days,} = \$0.037\frac{5}{8}$$

$$\text{Then } \$0.037\frac{5}{8} \times 917.30 = \$34.704516.$$

(58)

$$= \$0.042.$$

Interest on \$1 for 3 months	=	\$0.015
Interest on \$1 for 13 days	=	<u>2\frac{1}{2}</u>

$$\text{Therefore interest on $1 for 3 months 13 days} = \$0.017\frac{1}{2}$$

$$\text{Then } \$0.017\frac{1}{2} \times 842.50 = \$14.462916.$$

(59)

$$\text{ts} = \$0.13.$$

$$= \$0.133\frac{1}{2}.$$

Interest on \$1 for 2 years 11 months	=	\$0.175
Interest on \$1 for 10 days	=	<u>1\frac{3}{4}</u>

$$\text{Therefore interest on $1 for 2 yrs. 11 m'ths 10 days} = \$0.176\frac{3}{4}$$

$$\text{Then } \$0.176\frac{3}{4} \times 573.83 = \$101.3766.$$

(60)

Interest on \$1 for 6 years 9 months = \$0.405

Interest on \$1 for 19 days = 3½

Therefore interest on \$1 for 6 years 9 m'ths 19 days = \$0.408½

Then \$0.408½ × 642.30 = \$262.18545.

(61)

Interest on \$1 for 5 years 5 months = \$0.325

Interest on \$1 for 7 days = 1½

Therefore interest on \$1 for 5 years 5 months 7 days = \$0.326½

Then \$0.326½ × 1427.875 = \$465.7252.

(62)

Interest on \$1 for 4 years 7 months = \$0.275

Interest on \$1 for 16 days = 2½

Therefore interest on \$1 for 4 years 7 m'ths 16 days = \$0.277½

Then \$0.277½ × 709.63 = 197.040596.

(63)

Interest on \$1 for 7 years 7 months = \$0.456

Interest on \$1 for 22 days = 3½

Therefore interest on \$1 for 7 years 7 m'ths 22 days = \$0.458½

Then \$0.458½ × 2463.20 = \$1129.7877 + \$2463.20 = \$3592.9877.

(64)

Interest on \$1 for 9 years 9 months = \$0.585

Interest on \$1 for 9 days = 1½

Therefore interest on \$1 for 9 years 9 m'ths 9 days = \$0.586½

Then \$0.586½ × 999.99 = \$586.494135.

(65)

$$\begin{aligned}
 &\text{Interest on \$1 for 3 years 4 months} = \$0.20 \\
 &\text{Interest on \$1 for 27 days} = 4\frac{1}{2} \\
 &\text{Therefore interest on \$1 for 3 years 4 m'ths 27 days} = \$0.204\frac{1}{2} \\
 &\text{Then } \$0.2045 \times 68.70 = \$14.04916.
 \end{aligned}$$

(66)

$$\begin{aligned}
 &\text{Interest on \$1 for 3 years} = \$0.18 \\
 &\text{Interest on \$1 for 28 days} = 4\frac{1}{2} \\
 &\text{Therefore interest on \$1 for 3 years 28 days} = \$0.184\frac{1}{2} \\
 &\text{Then } \$0.184\frac{1}{2} \times 742.63 = \$137.139.
 \end{aligned}$$

(67)

$$\begin{aligned}
 &\text{Interest on \$1 for 7 years 4 months} = \$0.44 \\
 &\text{Interest on \$1 for 11 days} = 1\frac{1}{2} \\
 &\text{Therefore interest on \$1 for 7 years 4 m'ths 11 days} = \$0.441\frac{1}{2} \\
 &\text{Then } \$0.441\frac{1}{2} \times 200 = \$88.366 + \$200 = \$288.366.
 \end{aligned}$$

(68)

$$\begin{aligned}
 &\text{Interest on \$1 for 9 years 3 months} = \$0.555 \\
 &\text{Interest on \$1 for 9 days} = 1\frac{1}{2} \\
 &\text{Therefore interest on \$1 for 9 years 3 months 9 days} = \$0.556\frac{1}{2} \\
 &\text{Then } \$0.5565 \times 743.63 = \$413.830095 + \$743.63 = \$1157.460095.
 \end{aligned}$$

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(70)

$$\begin{aligned}
 &\text{Interest on \$1 at 6 per cent. for given time} = \$0.526\frac{1}{2} \\
 &\text{Interest on \$1234.56 at 6 per cent. for given time} = \$0.526\frac{1}{2} \times \\
 &\quad 1234.56 = \$650.2016. \\
 &\text{Hence interest on \$1234.56 at 7 per cent for given time} = \\
 &\quad \$650.2016 + \text{one sixth of } \$650.2016 = \$758.6695.
 \end{aligned}$$

K

(71)

Interest on \$1 at 6 per cent. for given time = \$0.126 $\frac{1}{2}$.Interest on \$9876.54 at 6 per cent. for given time = \$0.126 $\frac{1}{2}$ \times 9876.54 = \$1252.67449.Hence interest on \$9876.54 at 3 per cent. for given time = \$1252.67449 \div 2 = \$626.337245.

(72)

Interest on \$1 at 6 per cent. for given time = \$0.216 $\frac{1}{2}$.Interest on \$715.30 at 6 per cent. for given time = \$0.216 $\frac{1}{2}$ \times 715.30 = \$154.98166.

Hence interest on \$715.30 at 8 per cent. for given time = \$154.98166 + one third of \$154.98166 = \$206.6422.

(73)

Interest on \$1 at 6 per cent. for given time = \$0.141 $\frac{1}{2}$.Interest on \$555.55 at 6 per cent. for given time = \$0.141 $\frac{1}{2}$ \times 555.55 = \$78.51773.Hence interest on \$555.55 at 12 per cent. for given time = \$78.51773 \times 2 = \$157.03546 + \$555.55 = \$712.58546.

(74)

Interest on \$1 at 6 per cent. for given time = \$0.016 $\frac{1}{2}$.Interest on \$7766.55 at 6 per cent. for given time = \$0.016 $\frac{1}{2}$ \times 7766.55 = \$129.4425.

Hence interest on \$7766.55 at 5 per cent. for given time = \$129.4425 — one sixth of \$129.4425 = \$104.86875.

Amount = \$104.86875 + \$7766.55 = \$7874.41875.

(75)

Interest on \$1 at 6 per cent. for given time = \$0.521 $\frac{1}{2}$.Interest on \$500 at 6 per cent. for given time = \$0.521 $\frac{1}{2}$ \times 500 = \$260.666 $\frac{1}{2}$.Hence interest on \$500 at 16 per cent. for given time = \$260.666 $\frac{1}{2}$ \times 2 $\frac{1}{2}$ = \$695.111 + \$500 = \$1195.111.

(76)

126 $\frac{1}{2}$.

$$= \$0.126\frac{1}{2} \times$$

given time =

Interest on \$1 at 6 per cent. for given time = \$0.206 $\frac{1}{2}$.Interest on \$576 at 6 per cent. for given time = \$0.206 $\frac{1}{2}$ \times
576 = \$118.752.Hence interest on \$576 at 5 per cent. for given time = \$118.752
— one sixth of \$118.752 = \$98.96.

(77)

216 $\frac{1}{2}$.

$$= \$0.216\frac{1}{2} \times$$

given time =

6.6422.

Interest on \$1 at 6 per cent. for given time = \$0.151 $\frac{1}{2}$.Interest on \$2478.91 at 6 per cent. for given time = \$0.151 $\frac{1}{2}$ \times
2478.91 = \$376.38116.Hence interest on \$2478.91 at 4 $\frac{1}{2}$ per cent. for given time =
\$376.38116 — one fourth of \$376.38116 = \$282.285.

(78)

141 $\frac{1}{2}$.

$$= \$0.141\frac{1}{2} \times$$

given time =

\$712.58546.

From May 9th to December 11th = 216 days. Interest on \$1
at 6 per cent. for 216 days = \$0.036.Interest on \$780 at 6 per cent. for 216 days = \$0.036 \times 780 =
\$28.08.

(79)

0.016 $\frac{1}{2}$.

$$= \$0.016\frac{1}{2} \times$$

r given time =

86875.

374.41875.

From August 16th 1851 to June 19th 1852 = 308 days.

Interest on \$1 at 6 per cent. for given time = \$0.051 $\frac{1}{2}$.Interest on \$1830.63 at 6 per cent. for given time = \$0.051 $\frac{1}{2}$ \times
1830.63 = \$93.97234.Hence interest on \$1830.63 at 7 per cent. for given time =
\$93.97234 + one sixth of \$93.97234 = \$109.63439.

(80)

0.521 $\frac{1}{2}$.

$$= \$0.521\frac{1}{2} \times$$

given time =

5.111.

From September 3rd 1858 to January 9th 1859 = 128 days.

Interest on \$1 at 6 per cent. for given time = \$0.021 $\frac{1}{2}$.Interest on \$6200 at 6 per cent. for given time = \$0.021 $\frac{1}{2}$ \times
6200 = \$132.266.

Amount = \$132.266 + \$6200 = \$6332.266.

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(82)

From June	2nd to July	17th there are	45 days.
" July	17th to October	6th	" 81 "
" October	6th to December	11th	" 66 "
" December	11th to March	29th	" 109 "
" March	29th to October	7th	" 192 "

Whole sum \$1217.30 for 45 days = \$54778.50 for 1 day.
 1st endorsement 207.80

Balance \$1009.50 for 81 days = \$81769.50 for 1 day.
 2nd endorsement 209.60

Balance \$799.90 for 66 days = \$52793.40 for 1 day.
 3rd endorsement 320.90

Balance \$479.00 for 109 days = \$52211.00 for 1 day.
 4th endorsement 421.83

Balance \$57.17 for 192 days = \$10976.64 for 1 day.

Whole interest = that of \$252529.04 for 1 day.

Interest on \$252529.04 at 6 per cent. for 1 year = \$15151.7424.

Hence interest for 1 day = $\$15151.7424 \div 365 = \41.5116 .

Then interest due = \$41.5116

Balance on Note = \$57.17

Principal and interest due = \$98.6816

(83)

From 17th June	to 5th September there are 80 days.	
" 5th September to 7th December	"	93 "
" 7th December to 11th June	"	186 "
" 11th June to 7th February	"	241 "
" 7th February to 19th December	"	315 "
" 19th December to 1st May	"	133 "

Whole sum \$7348.25 for 80 days = \$587860.00 for 1 day.
 1st endorsement 2463.80

Balance \$4884.45 for 93 days = \$454253.85 for 1 day.
 2nd endorsement 392.20

Balance \$4492.25 for 186 days = \$835558.50 for 1 day.
 3rd endorsement 982.20

Balance \$3510.05 for 241 days = \$845922.05 for 1 day.
 4th endorsement 2842.90

Balance \$667.15 for 315 days = \$210152.25 for 1 day.
 5th endorsement 317.23

Balance \$349.92 for 133 days = \$46539.36 for 1 day.

Whole interest = that of \$2980286.01 for 1 day.

Interest on \$2980286.01 at 8 per cent. for 1 year = \$238422.8808.
 Hence interest for 1 day = $\$238422.8808 \div 365 = \653.2133 .

Then interest due = \$653.2133

Balance on Note = \$349.92

Principal and interest due = \$1003.1333

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(2)

\$1800 108	Principal. Interest for 1st year.
\$1908 114.48	Amount for 1 year = principal for 2nd year. Interest for 2nd year.
\$2022.48 121.3488	Amount for 2 years = principal for 3rd year. Interest for 3rd year.
\$2143.8288 128.629728	Amount for 3 years = principal for 4th year. Interest for 4th year.
\$2272.458528 136.347511	Amount for 4 years = principal for 5th year. Interest for 5th year.
\$2408.806039 1800	Amount for 5 years. Given Principal.
\$608.806 =	Compound interest required.
(3)	
\$700 49	Principal. Interest for 1st half year.
\$749 52.43	Amount for 1 half y. = principal for 2nd half y. Interest for 2nd half year.
\$801.43 56.1001	Amount for 1 year = principal for 3rd half y. Interest for 3rd half year.
\$857.5301 60.027107	Amount for 1½ years = principal for 2nd year. Interest for 2nd year.
\$917.557207 64.229004	Amount for 2nd year = principal for 5th half y. Interest for 5th half year.
\$981.786211 68.725034	Amount for 2½ years = principal for 3rd year. Interest for 3rd year.
\$1050.511245 73.535787	Amount for 3 years = principal for 7th half y. Interest for 7th half year.
\$1124.047032 700	Amount for 3½ years. Given Principal.
\$424.047 =	Compound interest required.

\$673.40
20.202

(4)
Principal.
Interest for 1st quarter.

\$693.602
20.80806

Amount for 1 quar. = principal for 1st half y.
Interest for 1st half year.

\$714.41006
21.4323018

Am't for 1 half y. = principal for 3rd quarter.
Interest for 3rd quarter.

\$735.8423618
22.0752708

Amount for 3 quarters = principal for 1st year.
Interest for 1st year.

\$757.9176326
22.7375289

Amount for 1 year = principal for 5th quarter.
Interest for 5th quarter.

\$780.6551615
23.4196548

Am't for 5 quarters = principal for 3rd half y.
Interest for 3rd half year.

\$804.0748163
24.1222444

Am't for 3 half y. = principal for 7th quarter.
Interest for 7th quarter.

\$828.1970807
24.8459124

Amount for 7 quarters = principal for 2nd year.
Interest for 2nd year.

\$853.0429 =
673.40

Amount for 2 years required.
Given Principal.

\$179.6429 = Compound Interest required.

\$860

(5)
Principal.

34.4

Interest for 1st half year.

\$894.4

Amount for 1 half year = principal for 1st year.
Interest for 1st year.

35.776

\$930.176

Amount for 1 year = principal for 3rd half year.
Interest for 3rd half year.

37.20704

\$967.38304

Amount for 3 half years = principal for 2nd y.
Interest for 2nd year.

38.69532

\$1006.07836

Amount for 2 years = principal for 5th half year.
Interest for 5th half year.

40.24313

\$1046.32149

Amount for 5 half years = principal for 3rd year.
Interest for 3rd year.

41.85285

\$1088.17434

= Amount for 3 years required.
Given Principal.

860

\$228.1743

= Compound Interest required.

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(8)

By the table the am't of \$1 at 6 per cent. for 11 years = \$1.9983.

Then $\$1.9983 \times 375 = \$1001.0125 = \text{Amount.}$

875	Principal.
-----	------------

 $\$786.0125 = \text{Interest.}$

(9)

By the table the am't of \$1 for the given time and rate = \$2.77247.

Then $\$2.77247 \times 643.98 = \$1785.41523 = \text{Amount.}$

643.98	Principal.
--------	------------

 $\$1141.43523 = \text{Interest.}$

(10)

By the table the am't of \$1 at 6 per cent. for 45 years = \$13.76461.

Then $\$13.76461 \times .01 = \$1.37646 = \text{Amount.}$

.01	Principal.
-----	------------

 $\$.127646 = \text{Interest.}$

(11)

By the table the am't of \$1 for the given time and rate = \$2.28793.

Then $\$2.28793 \times 78.2 = \$178.916 = \text{Amount.}$

78.2	Principal.
------	------------

 $\$100.716 = \text{Interest.}$

(12)

By the table the am't of \$1 for the given rate and time = \$2.40662.

Then $\$2.40662 \times 777.77 = \$1871.7968 = \text{Amount.}$

777.77	Principal.
--------	------------

 $\$1094.0268 = \text{Interest.}$

(13)

$$£44 \text{ 5s. 9d.} = £44.2875.$$

By the table the am't of £1 at 6 per cent. for 11 years = £1.8983.

$$\text{Then } £1.8983 \times 44.2875 = £84.07096 = £84 \text{ 1 5} = \text{Amount.}$$

$$\underline{44 \text{ 5 9}} \text{ Principal.}$$

$$£39 \text{ 15 8} = \text{Interest.}$$

(14)

$$£32 \text{ 4s. 9½d.} = £32.240625.$$

By the table the amount of £1 for the given time and rate =

$$£1.26532. \text{ Then } £1.26532 \times 32.240625 =$$

$$£40.7947076 = £40 \text{ 15 10½ nearly} = \text{Amount.}$$

$$\underline{32 \text{ 4 9½}} \text{ Principal.}$$

$$£8 \text{ 11 1} = \text{Interest.}$$

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(16)

Amount of \$1 for 7 years at 4 per cent = \$1.31593.

$$\$7439.87 \div 1.31593 = \$5653.697.$$

(17)

Amount of \$1 at 5 per cent for 20 years = \$2.6533.

$$\$9193.90 \div 2.6533 = \$3465.081.$$

(18)

$$£595 \text{ 10s. 2½d.} = £595.51.$$

Amount of £1 at 6 per cent for 3 years = £1.19102.

$$£595.51 \div 1.19102 = £500.$$

(19)

Amount of \$1 at 6 per cent for 7 years = \$1.50363.

$$\$7111.11 \div 1.50363 = \$4729.295.$$

(20)

$$£268 \text{ Os. } 4\text{d.} = £268.02.$$

$$\text{Amount of } £1 \text{ at } 5 \text{ per cent for } 6 \text{ years} = £1.3401.$$

$$£268.02 \div 1.3401 = £200.$$

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(3)

$$\text{Here } A = \$962, r = .04, \text{ and } t = 1. \quad \text{Whence } 1 + rt = 1.04.$$

$$\text{Then } \quad = \frac{A}{1 + rt} = \frac{962}{1.04} = \$925.$$

(4)

$$\text{Here } A = \$2202, r = .06, \text{ and } t = 5.75. \quad \text{Whence } 1 + rt = 1.345.$$

$$\text{Then } P = \frac{A}{1 + rt} = \frac{2202}{1.345} = \$1637.174.$$

(5)

$$\text{Here } A = \$1003.50, r = .06, \text{ and } t = \frac{1}{2} \text{ year. Whence } 1 + rt = 1.04.$$

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1003.50}{1.04} = \$964.9038.$$

(6)

$$\text{Here } A = \$716, r = .08, \text{ and } t = \frac{7}{12} \text{ year. Whence } 1 + rt = 1.04\frac{1}{3}.$$

$$\text{Then } P = \frac{A}{1 + rt} = \frac{716}{1.04\frac{1}{3}} = \$684.0764.$$

(7)

Here $A = \$1342.50$, $r = .065$, and $t = \frac{3}{4}$ year. Whence $1 + rt = 1.022\frac{1}{8}$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1342.50}{1.022\frac{1}{8}} = \$1313.266.$$

(8)

Here $A = \$2400$, $r = .05$, and $t = \frac{3}{4}$ year. Whence $1 + rt = 1.03\frac{1}{4}$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{2400}{1.03\frac{1}{4}} = \$2324.84.$$

(9)

Here $A = \$2202$, $r = .05$, and $t = .75$ year. Whence $1 + rt = 1.0375$.

$\$2202 \div 1.0375 = \$2122.40963+$ = Present worth.

$\$2202 - \$2122.40963+ = \$79.59036$ = Discount.

(10)

Here $A = \$4360$, $r = .06$, and $t = 1\frac{1}{4}$ year. Whence $1 + rt = 1.085$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{4360}{1.085} = \$4018.43317.$$

(11)

Here $A = \$1647$, $r = .06$, and $t = \frac{1}{2}$ year. Whence $1 + rt = 1.055$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1647}{1.055} = \$1561.13744.$$

(12)

Here $A = \$2000$, $r = .06$, and $t = 3\frac{1}{4}$ year. Whence $1 + rt = 1.215$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{2000}{1.215} = \$1646.09053.$$

(13)

Here $A = \$2070.90$, $r = .05$, and $t = 1\frac{1}{3}$. Whence $1 + rt = 1.07\frac{1}{3}$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{2070.90}{1.07\frac{1}{3}} = \$1918.9806.$$

$\$2070 - \$1918.9806 = \$151.919 = \text{Discount required.}$

(14)

Here $A = \$970.63$, $r = .08$, and $t = \frac{1}{2}$ year. Whence $1 + rt = 1.07\frac{1}{2}$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{970.63}{1.07\frac{1}{2}} = \$904.313.$$

(15)

Here in first case $A = \$1512$, $r = .07$, and $t = .5$ year. Whence $1 + rt = 1.035$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1512}{1.035} = \$1460.8695.$$

Also $A = 1512$, $r = .07$, and $t = 1$. Whence $1 + rt = 1.07$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{1512}{1.07} = \$1413.0841.$$

$\$1460.8695 + \$1413.0841 = \$2873.9536 = \text{Present worth of whole amount.}$

$\$3024 - \$2873.9536 = \$150.0464 = \text{Discount required.}$

(16)

Here in first case $A = \$440$, $r = .08$, and $t = 1.25$. Whence $1 + rt = 1.1$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{440}{1.1} = \$400.$$

In second case $A = \$896$, $r = .08$, and $t = 1.5$. Whence $1 + rt = 1.12$.

$$\text{Then } P = \frac{A}{1 + rt} = \frac{896}{1.12} = \$800.$$

$\$400 + \$800 = \$1200.$

Page 265.

(18)

Here the time the note has to run is 2 years, 3 months, 3 days.
 Interest of \$1 at 7 per cent for 2 yrs., 3 m., 3 days = $\$0.1580\frac{1}{2}$.
 Interest of \$986 at 7 per cent for 2 years, 3 months, 3 days =
 $\$0.1580\frac{1}{2} \times 986 = \155.8701 .

(19)

Here the time the note has to run is 103 days = 3 months 13 days.
 Interest of \$1 at 8 per cent for 3 months 13 days = $\$0.022\frac{1}{2}$.
 Interest of \$640 at 8 per cent for 3 months, 13 days =
 $\$0.022\frac{1}{2} \times 640 = \14.6488 .

(20)

Here the time the note has to run is 94 days = 3 months 4 days.
 Interest of \$1 at 6 per cent for 3 months 4 days = $\$0.015\frac{1}{2}$.
 Interest of \$563.80 at 6 per cent for 3 months 4 days =
 $\$0.015\frac{1}{2} \times 563.80 = \8.8328 and $\$563.80 - \$8.8328 = \$554.967$.

Page 266.

(22)

Interest on \$1 for 93 days at 7 p. c. = $\$0.0180\frac{1}{2}$, and this taken
 from \$1 gives a remainder of $\$0.9819\frac{1}{2}$ = present worth of \$1.
 Then $\$3755 \div 0.9819\frac{1}{2} = \3824.15 .

(23)

Interest on \$1 for 6 months 3 days at 5 per cent = $\$0.0254\frac{1}{2}$,
 and this taken from \$1 gives a remainder $\$0.9745\frac{1}{2}$ = present
 worth of \$1.
 Then $\$1147.80 \div 0.9745\frac{1}{2} = \1177.734 .

(24)

Interest on \$1 for 48 days at $3\frac{1}{2}$ per cent = $\$0.004\frac{1}{2}$, and this taken from \$1 gives a remainder $\$0.995\frac{1}{2}$ = present worth of \$1.

$$\text{Then } \$713.90 \div 0.995\frac{1}{2} = \$717.2471.$$

Page 268.

(4)

$$\begin{array}{r} \$200 \times 3 = 600 \\ 150 \times 4 = 600 \\ 250 \times 6 = 1500 \\ \hline 600 \quad 600)2700(4\frac{1}{2} \text{ months.} \\ \underline{2400} \\ 300 \} \\ \underline{600} \} = 1 \end{array}$$

(5)

$$\begin{array}{r} \frac{1}{4} \times 0 = 0 \\ \frac{1}{4} \times 3 = \frac{3}{4} \\ \frac{1}{4} \times 6 = 1\frac{1}{2} \\ \frac{1}{4} \times 9 = 2\frac{1}{4} \\ \hline 1 \quad 1)4\frac{1}{4} \\ \hline 4\frac{1}{4} \text{ months.} \end{array}$$

(6)

$$\begin{array}{r} \$50 \times 2 = 100 \\ 40 \times 5 = 200 \\ 30 \times 7 = 210 \\ \hline 120 \quad 120)510(4\frac{1}{2} \text{ months.} \\ \underline{480} \\ 30 \} \\ \underline{120} \} = 1 \end{array}$$

(7)

$$\begin{array}{r} \$1000 \times 0 = 0 \\ 1500 \times 1 = 1500 \\ 600 \times 3 = 1800 \\ 700 \times 5 = 3500 \\ 1400 \times 7 = 9800 \\ \hline 5200 \quad 5200)16600(3\frac{1}{2} \text{ months.} \\ \underline{15600} \\ 1000 \} \\ \underline{5200} \} = \frac{5}{8} \end{array}$$

Pag

Six r

Six r

Six r

Six r

Theref

W

That is,

(8)

Six months from 15th January = 15th July, and from 1st July to 15th July there are 14 days.

Six months from 10th February = 10th August, and from 1st July to 10th August there are 40 days.

Six months from 6th March = 6th September, and from 1st July to 6th September there are 67 days.

Six months from 8th June = 8th December, and from 1st July to 8th December there are 160 days.

$$\$3750 \times 14 = 52500$$

$$3000 \times 40 = 120000$$

$$2400 \times 67 = 160800$$

$$2250 \times 160 = 360000$$

$$\begin{array}{r} 11400 \\ 11400 \end{array} \quad \begin{array}{r} 693300 \\ 684000 \end{array} \quad (60\frac{3}{4} \text{ days.})$$

$$\begin{array}{r} 9300 \\ 11400 \end{array} \left. \vphantom{\begin{array}{r} 9300 \\ 11400 \end{array}} \right\} = 3\frac{1}{4}$$

$$\begin{array}{r} 9300 \\ 11400 \end{array} \left. \vphantom{\begin{array}{r} 9300 \\ 11400 \end{array}} \right\} = 3\frac{1}{4}$$

Therefore the note must be made payable on the 61st day from the 1st of July, which is the 31st of August.

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(2)

Whole stock : A's stock :: whole profit : A's profit.

That is, \$4300 : \$3000 :: \$1117 : $\frac{1117 \times 3000}{4300} = \$779.302+ = \text{A's sh.}$

$\$1117 - \$779.302+ = \$337.697 = \text{B's share.}$

(3)

Whole stock = \$6470 + \$3780 + \$9860 = \$20110.

Whole stock : A's stock :: whole profit : A's profit.

$$\text{That is, } \$20110 : \$6470 :: \$7890 : \frac{7890 \times 6470}{20110} = \$2538.453 = \text{A's sh.}$$

Again, whole stock : B's stock :: whole profit : B's profit.

$$\text{That is, } \$20110 : \$3780 :: \$7890 : \frac{7890 \times 3780}{20110} = \$1483.053 = \text{B's sh.}$$

Lastly, whole stock : C's stock :: whole profit : C's profit.

$$\text{That is, } \$20110 : \$9860 :: \$7890 : \frac{7890 \times 9860}{20110} = \$3868.493 = \text{C's sh.}$$

(4)

Whole stock : B's stock :: whole gain : B's gain.

$$\text{That is, } \$320 : \$120 :: \$80 : \frac{80 \times 120}{320} = \$30 = \text{B's gain.}$$

Again, whole stock : C's stock :: whole gain : C's gain.

$$\text{That is, } \$320 : \$200 :: \$80 : \frac{80 \times 200}{320} = \$50 = \text{C's share.}$$

(5)

Whole stock : B's stock :: whole gain : B's gain.

$$\text{That is, } \$2800 : \$1200 :: \$728 : \frac{728 \times 1200}{2800} = \$312 = \text{B's gain.}$$

Again, whole stock : C's stock :: whole gain : C's gain.

$$\text{That is, } \$2800 : \$1600 :: \$728 : \frac{728 \times 1600}{2800} = \$416 = \text{C's gain.}$$

(6)

Whole stock : B's stock :: whole amount to be divided : B's share.

$$\text{That is, } \$3 : \$2 :: \$100 : \frac{100 \times 2}{3} = \$66.66\frac{2}{3} = \text{B's share.}$$

Again, whole st'k : C's st'k :: whole amo't to be divided : C's sh'e.

$$\text{That is, } \$3 : \$1 :: \$100 : \frac{100 \times 1}{3} = \$33.33\frac{1}{3} = \text{C's share.}$$

(7)

$$£1400 : £500 :: £1100 : \frac{1100 \times 500}{1400} = £392\frac{2}{7} = \text{B's share.}$$

$$£1100 - £392\frac{2}{7} = £707\frac{1}{7} = \text{C's share.}$$

(8)

$$\begin{array}{l} \text{casks. casks. } 180 \times 200 \\ 900 : 200 :: 180 : \frac{180 \times 200}{900} = 40 \text{ casks} = \text{B's loss.} \end{array}$$

$$\begin{array}{l} 180 \times 300 \\ 900 : 300 :: 180 : \frac{180 \times 300}{900} = 60 \text{ casks} = \text{C's loss.} \end{array}$$

$$180 - (40 + 60) = 80 \text{ casks} = \text{D's loss.}$$

(9)

$$\$1800 : \$800 :: \$100 : \frac{100 \times 800}{1800} = \$44.44\frac{4}{9} = \text{B's share.}$$

$$\$1800 : \$600 :: \$100 : \frac{100 \times 600}{1800} = \$33.33\frac{1}{3} = \text{C's share.}$$

$$\$44.44\frac{4}{9} + \$33.33\frac{1}{3} = \$77.77\frac{7}{9}, \text{ and } \$100 - \$77.77\frac{7}{9} = \\ \$22.22\frac{2}{9} = \text{D's share.}$$

.L.

(10)

$$6 : 1 :: 120 : \frac{120 \times 1}{6} = 20.$$

$$6 : 2 :: 120 : \frac{120 \times 2}{6} = 40.$$

$$6 : 3 :: 120 : \frac{120 \times 3}{6} = 60.$$

(11)

$$\text{Whole loss} = \$900 - \$540 = \$360.$$

$$8 : 1 :: \$360 : \frac{360}{8} = \$45 = \text{B's loss.}$$

$$8 : 2 :: \$360 : \frac{360 \times 2}{8} = \$90 = \text{C's loss.}$$

$$\$45 + 90 = \$135, \text{ and } \$360 - 135 = \$225 = \text{D's loss.}$$

(12)

$$\$12 : \$6 :: \$1320 : \frac{1320 \times 6}{12} = \$660 = \text{B's gain.}$$

$$\$12 : \$4 :: \$1320 : \frac{1320 \times 4}{12} = \$440 = \text{C's gain.}$$

$$\$12 : \$2 :: \$1320 : \frac{1320 \times 2}{6} = \$220 = \text{D's gain.}$$

(13)

$$£35 + £29 = £64, \text{ and } £110 - £64 = £46 = \text{D's profit.}$$

$$\text{D's profit} : \text{B's profit} :: \text{D's stock} : \text{B's stock.}$$

$$\text{That is, } £46 : £35 :: £1090 : \frac{1090 \times 35}{46} = £829 \text{ 6s. } 11\frac{1}{3}\text{d.} = \text{B's st.}$$

$$\text{Again, D's profit} : \text{C's profit} :: \text{D's stock} : \text{C's stock.}$$

$$\text{That is, } £46 : £29 :: £1090 : \frac{1090 \times 29}{46} = £687 \text{ 3s. } 5\frac{1}{3}\text{d.} = \text{C's st.}$$

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(2)

$$\left. \begin{array}{l} \$357 \times 5 = \$1785 \text{ for one month} \\ 371 \times 7 = 2597 \text{ for one month} \\ 154 \times 11 = 1694 \text{ for one month} \end{array} \right\} = \$6076 \text{ for one month.}$$

$$\$6076 : \$1785 :: \$347.20 : \frac{347.20 \times 1785}{6076} = \$102.$$

$$\$6076 : \$2597 :: \$347.20 : \frac{347.20 \times 2597}{6076} = \$148.40.$$

$$\$6076 : \$1694 :: \$347.20 : \frac{347.20 \times 1694}{6076} = \$96.80.$$

(3)

$$\left. \begin{array}{l} 40 \times 6 = 240 \text{ for one month} \\ 30 \times 5 = 150 \text{ for one month} \\ 50 \times 1 = 50 \text{ for one month} \end{array} \right\} = 440 \text{ for one month.}$$

$$440 : 240 :: \$160 : \frac{160 \times 240}{440} = \$87.27\frac{2}{11}; \text{ B's share.}$$

$$440 : 150 :: \$160 : \frac{160 \times 150}{440} = \$54.54\frac{2}{11}; \text{ O's share.}$$

$$440 : 50 :: \$160 : \frac{160 \times 50}{440} = \$18.18\frac{2}{11}; \text{ D's share.}$$

(4)

$$\left. \begin{array}{l} £150 \times 6 = £900 \text{ for one month} \\ 200 \times 3 = 600 \text{ for one month} \\ 125 \times 16 = 2000 \text{ for one month} \end{array} \right\} = £3500 \text{ for one month.}$$

$$£3500 : £900 :: £291 \text{ } 13\text{s. } 4\text{d.} : \frac{£291 \text{ } 13\text{s. } 4\text{d.} \times 900}{3500} = £75.$$

$$£3500 : £600 :: £291 \text{ } 13\text{s. } 4\text{d.} : \frac{£291 \text{ } 13\text{s. } 4\text{d.} \times 600}{3500} = £50.$$

$$£3500 : £2000 :: £291 \text{ } 13\text{s. } 4\text{d.} : \frac{£291 \text{ } 13\text{s. } 4\text{d.} \times 2000}{3500} = £166 \text{ } 13\text{s. } 4\text{d.}$$

(5)

$$\begin{aligned} \$4000 \times 12 &= \$48000 \text{ for one month } \\ 3000 \times 15 &= 45000 \text{ for one month } \\ 5000 \times 8 &= 40000 \text{ for one month } \end{aligned}$$

$$\$133000 : \$48000 :: \$665 : \frac{665 \times 48000}{133000} = \$240; \text{ B's share.}$$

$$\$133000 : \$45000 :: \$665 : \frac{665 \times 45000}{133000} = \$225; \text{ C's share.}$$

$$\$133000 : \$40000 :: \$665 : \frac{665 \times 40000}{133000} = \$200; \text{ D's share.}$$

(6)

$$\begin{aligned} 56 \times 12 &= 672 \text{ for one day } \\ 64 \times 15 &= 960 \text{ for one day } \\ 80 \times 18 &= 1440 \text{ for one day } \end{aligned} \quad \left. \vphantom{\begin{aligned} 56 \times 12 \\ 64 \times 15 \\ 80 \times 18 \end{aligned}} \right\} = 3072 \text{ for one day.}$$

$$3072 : 672 :: \$320 : \frac{320 \times 672}{3072} = \$70 = \text{rent to be paid by 1st troop.}$$

$$3072 : 960 :: \$320 : \frac{320 \times 960}{3072} = \$100 = \text{" " " 2nd "}$$

$$3072 : 1440 :: \$320 : \frac{320 \times 1440}{3072} = \$150 = \text{" " " 3rd "}$$

(8)

$$\text{Sum of profits} = 240 + 800 + 400 = \$1440.$$

$$\text{Whole profit : A's profit :: Whole stock for 1 m. : A's st. for 1 m.}$$

$$\text{That is, } 1440 : 240 :: 34560 : \frac{34560 \times 240}{1440} = 5760 = \text{A's stock}$$

$$\text{for one month. Hence, since A's stock is for 6 months, it will be } \$5760 \div 6 = \$960.$$

(Continued on next page.)

(8 Continued.)

Whole profit : B's profit :: Whole stock for 1 m. : B's st. for 1 m.
 34560×800

$$1440 : 800 :: 34560 : \frac{34560 \times 800}{1440} = 19200 = \text{B's stock for one}$$

month. And, since B's stock was in for 12 months, $19200 \div 12 = \$1600$ will be his stock.

Whole profit : C's profit :: whole stock for 1 m. : C's st. for 1 m.
 34560×400

$$1440 : 400 :: 34560 : \frac{34560 \times 400}{1440} = \$9600 = \text{C's stock for one}$$

month and hence his stock will be $\$9600 \div 15 = \640 .

(9)

A's profit was \$240 for 6 months = \$40 for 1 month.

B's profit was \$800 for 12 months = \$66 $\frac{2}{3}$ for 1 month.

C's profit was \$400 for 15 months = \$26 $\frac{2}{3}$ for 1 month.

Sum of profits for 1 month = \$133 $\frac{1}{3}$

Whole profit for 1 m. : A's profit for 1 m. :: whole stock : A's st.
 3200×40

$$133\frac{1}{3} : 40 :: 3200 : \frac{3200 \times 40}{133\frac{1}{3}} = \$960 = \text{A's stock.}$$

$$133\frac{1}{3} : 66\frac{2}{3} :: 3200 : \frac{3200 \times 66\frac{2}{3}}{133\frac{1}{3}} = \$1600 = \text{B's stock.}$$

$$133\frac{1}{3} : 26\frac{2}{3} :: 3200 : \frac{3200 \times 26\frac{2}{3}}{133\frac{1}{3}} = \$640 = \text{C's stock.}$$

\$1440.

A's st. for 1 m.

\$0 = A's stock

for 6 months,

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(4)

\$1.12 $\frac{1}{2}$ = selling price.

\$0.09 = buying price.

\$0.03 $\frac{1}{2}$ = gain per lb.\$0.03 $\frac{1}{2}$ \times 817 = \$11.09 $\frac{1}{2}$.

(5)

\$1.20 = selling price.

\$0.87 $\frac{1}{2}$ = buying price.\$0.32 $\frac{1}{2}$ = gain per bushel.\$0.32 $\frac{1}{2}$ \times 2138 = \$694.85

(6)

$\$0.15 \times 317 \times 13 = \$618.15 = \text{cost of 13 barrels at } \0.15 per lb.
 $\$735 - 618.15 = \116.85 gain.

(7)

$\$3.15 \times 22 \times 17 = \$1178.10 = \text{price of 17 kegs at } \3.15 per gal.
 $\$0.37\frac{1}{2} \times 1178.1 = \$441.7875 = \text{ad valorem duty.}$
 $\$1178.10 + \$441.7875 + \$26.33 = \$1646.2175 = \text{whole cost,}$
 $\$1646.2175 - \$1625 = \$21.2175 \text{ loss.}$

Page 276.

(10)

Here for every \$1 I expend I wish to receive \$1.30, and hence the selling price will be $\$3.25 \times 1.30 = \$4.22\frac{1}{2}$.

(11)

Here for every \$1 I expend I wish to receive \$1.05, and hence the selling price will be $\$1.05 \times 13420 = \14091 .

(12)

Here for every \$1 I expend I desire to receive \$1.15, and hence the selling price will be $\$1.15 \times .11 = \$0.1265 = 12\frac{1}{2}$ cents.

(13)

Here for every \$1 I expend I wish to receive \$1.23, and hence the selling price will be $\$1.23 \times 15.25 = \$18.75\frac{1}{2}$.

(14)

Here for every \$1 I expend I am willing to receive \$0.89, and hence the selling price will be $\$0.89 \times 7890 = \7022.10 .

Page 277.

(16)

Here the whole gain is $\$0.87\frac{1}{2} - \$0.60 = \$0.27\frac{1}{2}$.

That is, $\$0.60$ gain $\$0.27\frac{1}{2}$, and therefore 1 cent gains $\frac{27\frac{1}{2}}{60} =$

$$1\frac{1}{2} = \frac{1}{2} \text{ of a cent.}$$

And hence, the gain per cent $= \frac{1}{2} \times 100 = 50 = 50\frac{1}{2}$ per cent.

(17)

Here the loss on each lb. is 2 cents.

That is, every 13 cents invested gives a loss of 2 cents.

Therefore every cent invested loses $\frac{1}{13}$ of 2 $= \frac{2}{13}$ cents.

And hence, the loss per cent $= \frac{2}{13} \times 100 = 15\frac{5}{13} = 15\frac{5}{13}$ per c.

(18)

Here the gain on each barrel is $\$1.60$.

That is, every $\$6.20$ invested gives a gain of $\$1.60$.

Therefore every $\$1$ invested gains $\frac{160}{620}$ of 100 $= \frac{80}{31}$ of a $\$$.

And hence, the gain per cent $= \frac{80}{31} \times 100 = 258 = 25\frac{8}{31}$ p.c.

(19)

Here the gain on each yard is 35 cents.

That is, every $\$2.75$ invested gives a gain of 35 cents.

Therefore every $\$1$ invested gains $\frac{35}{275}$ of 100 $= \frac{70}{55} = \frac{14}{11}$ of a dollar.

And hence the gain per cent $= \frac{14}{11} \times 100 = 127\frac{2}{11} = 127\frac{2}{11}$ p.c.

(20)

Here the gain on every bushel is 9 cents.

That is every 47 cents invested gives a gain of 9 cents.

Therefore every cent invested gains $\frac{9}{47}$ of 100 $= \frac{900}{47}$ cents.

And hence the gain per cent $= \frac{900}{47} \times 100 = 1914\frac{2}{47}$ p.c.,

(21)

Here the loss on each lb. is $1\frac{1}{2}$ cents.

That is every 12 cents invested gives a loss of $1\frac{1}{2}$ cents.

Therefore every cent invested gives $\frac{1}{8}$ of $1\frac{1}{2} = \frac{1}{4}$ of a cent.

And hence, the gain per cent $= \frac{1}{4} \times 100 = \frac{100}{4} = 25$ p. c.

(22)

Here the whole gain is $\$127 - \$93 = \$34$.

That is, \$93 gain \$34, and therefore \$1 gains $\frac{34}{93}$ of a dollar.

Hence, gain per cent $= \frac{34}{93} \times 100 = \frac{3400}{93} = 36\frac{2}{3}$ per cent.

(23)

Here the loss is $\$6742.50 - \$6000 = \$742.50$.

That is, \$6742.50 lose \$742.50, and therefore \$1 loses $\frac{742.50}{6742.50}$ of 742.50 = $\frac{99}{899}$ of a dollar.

Hence gain per cent $= \frac{99}{899} \times 100 = \frac{9900}{899} = 11\frac{11}{899}$ per cent.

(24)

Here $\$5700 + \$275 + \$1987.32 = \$7962.32 =$ whole sum expended.

Whole gain $= \$8750 - \$7962.32 = \$787.68$.

That is, \$7962.32 gain \$787.68, and therefore \$1 gains $\frac{787.68}{7962.32}$ of 787.68 = $\frac{9846}{99629}$ of a \$.

Hence gain per cent $= \frac{9846}{99629} \times 100 = \frac{984600}{99629} = 9.89$ or nearly 10 per cent.

(25)

$\$4.25 \times 723 = \$3072.75 =$ price of 723 yds. @ \$4.25.

$\$3072.75 \times .07 = \$215.0925 =$ amount for Insurance.

$\$3072.75 \times .22 = \$676.005 =$ amount for ad valorem duty.

Then whole cost $= \$3072.75 + \$215.0925 + \$23.70 + \$2.70 + \$3.16 + \$676.005 = \$3993.4075$.

Whole gain $= \$5270 - \$3993.4075 = \$1276.5925$.

That is, \$3993.4075 gains \$1276.5925 \therefore \$1 gains $\frac{1276.5925}{3993.4075}$ of \$1276.5925 = $\frac{510637}{1597383}$ of a \$.

Hence gain per cent $= \frac{510637}{1597383} \times 100 = 31.96749$ or nearly 32 per cent.

Page 278.

(27)

Loss on \$1 is 4 cents, or for every \$1 paid I receive \$0.96.
Hence cost = $\$24.60 \div 0.96 = \25.625 .

(28)

Loss on \$1 is 10 cents, or for every \$1 paid he receives \$0.90.
Hence cost = $\$2360 \div .90 = \2622.22 .

(29)

Gain on \$1 is 11 cents, or for every \$1 paid he receives \$1.11.
Hence cost = $\$7400 \div 1.11 = \6666.666 .

(30)

Gain on \$1 is 17 cents, or for every \$1 paid he receives \$1.17.
 $\$117 : \$100 :: \$3789.40 : \frac{3789.40 \times 100}{117} = \3238.803 Ans.

(31)

Loss on \$1 is 13 cents, or for every \$1 paid I receive \$0.87.
 $\$87 : \$100 :: \$2740 : \frac{2740 \times 100}{87} = \3149.425 Ans.

Page 279.

(3)

\$2 gains 50 cents.

Hence $\$0.50 : \$0.10 :: \$2.00 : \frac{2.00 \times 10}{50} = 40 \text{ cents,}$

(4)

$$\$2.00 : \$2.80 :: \$2.50 : \frac{2.50 \times 2.80}{2.00} = \$3.50.$$

(5)

8 cents gain 5 cents in 9 months.

$$\text{Hence 9 mo's : 6 mo's :: 5 cents : } \frac{5 \times 6}{9} = 3\frac{1}{3} = \text{gain for 6 mo's.}$$

$$8 \text{ cts. : 12 cts. :: } 3\frac{1}{3} : \frac{3\frac{1}{3} \times 12}{8} = 5 \text{ cts. gain on 12 cts. for 6 mo's.}$$

Therefore $12 + 5 = 17 =$ his selling price.

(6)

$$\$1.60 : \$1.85 :: \$.55 : \frac{1.85 \times .55}{1.60} = \$0.6359375 = \text{what L}$$

ought to get in order to sell at the same profit as K.
But L only gets 60 cents, therefore K has the advantage.

$$70 \text{ yds. of cloth at } \$1.85 = \$1.85 \times 70 = \$129.50.$$

$$\$129.50 \div \$.60 = 215\frac{5}{6}.$$

(7)

$$\begin{aligned} 5 \text{ tons of butter at } \$102 &= \$102 \times 5 = \$510 \\ 10\frac{1}{2} \text{ tons of tallow at } \$135 &= \$135 \times 10\frac{1}{2} = \$1417.50 \end{aligned}$$

$$\text{Total value} = \$1927.50$$

$$\text{Deduct ready money, } \$600.30$$

$$\underline{\$1327.20}$$

$$\$1327.20 \div \$4.20 = 316 \text{ barrels.}$$

Page 281.

(3)

$$\begin{array}{r}
 7 \text{ oz.} \times 22 = 154 \text{ carats.} \\
 12\frac{1}{2} \text{ " } \times 21 = 262\frac{1}{2} \text{ " } \\
 17 \text{ " } \times 9 = 153 \text{ " } \\
 \hline
 36\frac{1}{2} \quad 36\frac{1}{2} 569\frac{1}{2} \text{ " } \\
 \quad \quad 2 \quad 2 \text{ " } \\
 \hline
 73)1239(15\frac{1}{2} \text{ carats.} \\
 \quad 73 \\
 \hline
 \quad 409 \\
 \quad 365 \\
 \hline
 \quad \quad 44
 \end{array}$$

(4)

$$\begin{array}{r}
 2 \text{ gallons @ } 14s. = 28s. \\
 1 \text{ " @ } 12s. = 12s. \\
 2 \text{ " @ } 9s. = 18s. \\
 4 \text{ " @ } 8s. = 32s. \\
 \hline
 9)90s. \\
 \hline
 10s.
 \end{array}$$

(5)

$$\begin{array}{r}
 15 \text{ bushels @ } \$1.20 = \$18.00 \\
 30 \text{ " @ } \$1.50 = \$45.00 \\
 60 \text{ " @ } \$1.10 = \$66.00 \\
 83 \text{ " @ } \$1.75 = \$145.25 \\
 \hline
 188 \quad 188) \$274.25 (\$1.458 \\
 \quad 188 \\
 \hline
 \quad 86.2 \\
 \quad 75.2 \\
 \hline
 \quad 11.05 \\
 \quad 9.40 \\
 \hline
 \quad 1.650 \\
 \quad 1.504 \\
 \hline
 \quad \quad .146
 \end{array}$$

(6)

12 lbs. @ 50 cents = 600 cents.

16 " @ 72 " = 1152 "

22 " @ 65 " = 1430 "

18 " @ 85 " = 1530 "

100 " @ 42 " = 4200 "

168 168)8912 cents ($53\frac{1}{2}$ cents.

840

512

504

8 } = $\frac{1}{2}$.
168 }

Page 283.

(11)

Prices. Differences. Prices.

$$125 = \left\{ \begin{array}{l} 160 - 35 \quad \overbrace{15 + 110} \\ 140 - 15 \quad \quad 25 + 100 \end{array} \right\} = 125$$

Prices. Differences. Prices.

$$125 = \left\{ \begin{array}{l} 160 - 35 \quad \overbrace{15 + 110} \\ 140 - 15 \quad \quad 25 + 100 \end{array} \right\} = 125.$$

Ans. 35 bush. @ \$1.10, 15 @ \$1.60, 15 @ \$1, and 25 @ \$1.40.

35 bush. @ \$1.00, 15 @ \$1.40, 15 @ \$1.10, and 25 @ \$1.60.

(12)

$$45 = \left\{ \begin{array}{l} \overbrace{60 - 15} \quad 3 + 42 \\ 50 - 5 \quad 7 + 38 \\ \quad \quad 15 + 30 \end{array} \right\} = 45$$

$$\left\{ \begin{array}{l} \overbrace{60 - 15} \quad 3 + 42 \\ 50 - 5 \quad 7 + 38 \\ \quad \quad 15 + 30 \end{array} \right\} = 45.$$

Ans. 15 quarts @ 42 cents, 3 @ 60 cents, 5 @ 38 cents, 5 @ 30 cents, and 7 + 15 + 22 @ 50 cents.

15 quarts @ 38 cents, 3 @ 50 cents, 5 @ 42 cents, 15 @ 38 cents, and 7 + 15 = 22 @ 60 cents.

(13)

$$12\frac{1}{2} = \left\{ \begin{array}{l} \overbrace{18 + 5\frac{1}{2}} \quad \quad \quad \\ 17 + 4\frac{1}{2} \\ 16 + 3\frac{1}{2} \quad \quad \quad \frac{1}{2} + 12 \\ 15 + 2\frac{1}{2} \quad \quad \quad 2\frac{1}{2} + 10 \\ 14 + 1\frac{1}{2} \end{array} \right\} = 12\frac{1}{2}.$$

Ans. $\frac{1}{2}$ lb. @ 18 cents, $\frac{1}{2}$ @ 17 cents, $\frac{1}{2}$ @ 16 cents, $2\frac{1}{2}$ @ 15 cents, $2\frac{1}{2}$ @ 14 cents, $5\frac{1}{2} + 4\frac{1}{2} + 3\frac{1}{2} = 13\frac{1}{2}$ @ 12 cents, and $2\frac{1}{2} + 1\frac{1}{2} = 4$ @ 10 cents.

(14)

Prices. Differences. Prices.

$$10 = \left\{ \begin{array}{l} \overbrace{13 - 3} \quad 5 + 7 \\ 12 - 2 \quad 5 + 5 \end{array} \right\} = 10$$

Ans. 3 lbs. @ 7d., 3 @ 13d., 2 @ 5d., and 5 @ 12d.

Page 284.

(17)

By case I we find that 17 quarts @ 31 cents, 6 @ 16 cents, 6 @ 19 cents, and 6 @ 23 cents will make a mixture worth 25 cents per quart.

Therefore 17 qts. : 87 qts. :: 6 qts. : $\frac{6 \times 87}{17} = 30\frac{1}{2}$ quarts @

16 cents, and as there are 6 lbs. at each of the other prices, the same statement may be used, and the answer is therefore $30\frac{1}{2}$ quarts @ each price.

(18)

To produce a mixture worth 75 cents per bushel, we require 45 bushels @ 80 cents, 5 @ 37 cents, and 5 @ 68 cents.

Therefore 45 bush. : 70 bush. :: 5 bush. : $\frac{5 \times 70}{45} = 7\frac{2}{3}$ bush.
oats @ 37 cents.

45 bush. : 70 bush. :: 5 bush. : $\frac{5 \times 70}{45} = 7\frac{2}{3}$ bush.
barley @ 68 cents.

(19)

To produce a mixture worth 1s. per lb., we require $1\frac{1}{2}$ lbs. @ 16d., $1\frac{1}{2}$ @ 14d., and 6 @ 10 $\frac{1}{2}$ d.

Then $1\frac{1}{2}$ lbs. : 50 lbs. :: $1\frac{1}{2}$ lbs. : 50 lbs. brass @ 14d.

$1\frac{1}{2}$ lbs. : 50 lbs. :: 6 lbs. : 200 lbs. pewter @ 10 $\frac{1}{2}$ d.

(20)

By case I we find that 1 oz. of 20 carats fine, 1 of 21 carats fine and 3 of 23 carats fine, will make a mixture 22 carats fine.

Then 1 oz. : 30 oz. :: 1 oz. : 30 oz. of 21 carats fine.

1 oz. : 30 oz. :: 3 oz. : 90 oz. of 23 carats fine.

Page 285.

(22)

To produce a mixture worth \$1.40 per lb., we require 20 lbs. @ \$1.00, 40 @ \$1.20, 40 @ \$1.60, and 20 @ \$1.80. But all of these added together, will make 120 lbs.

lbs. lbs. lbs. lbs.
Therefore 120 : 20 :: 168 : $\frac{168 \times 20}{126} = 28$ lbs., the required quantity @ \$1.00.

120 : 40 :: 168 : $\frac{168 \times 40}{126} = 56$ lbs., the required quantity @ \$1.20.

120 : 40 :: 168 : $\frac{168 \times 40}{120} = 56$ lbs., the required quantity @ \$1.60.

120 : 20 :: 168 : $\frac{168 \times 20}{120} = 28$ lbs., the required quantity @ \$1.80.

(23)

To produce a mixture worth 4s. 4d. per lb., we require 10 lbs. @ 5s. and 8 @ 3s. 6d. But these added together make 18 lbs.

lbs. lbs. lbs. lbs.
Therefore 18 : 10 :: 27 : $\frac{27 \times 10}{18} = 15$ lbs., the required quantity of tea @ 5s.

18 : 8 :: 27 : $\frac{27 \times 8}{18} = 12$ lbs., the required quantity of tea @ 3s. 6d.

(24)

To produce a mixture worth \$2.70 per gallon, we require 20 gallons @ \$2.40, 10 @ \$2.60, 10 @ \$2.80, and 30 @ \$2.90. But all of these added together will make 70 gallons. Therefore

$$70 : 20 :: 63 : \frac{63 \times 20}{70} = 18 \text{ gallons, the required quantity of brandy @ \$2.40.}$$

$$70 : 10 :: 63 : \frac{63 \times 10}{70} = 9 \text{ gallons, the required quantity of brandy @ \$2.60.}$$

$$70 : 10 :: 63 : \frac{63 \times 10}{70} = 9 \text{ gallons, the required quantity of brandy @ \$2.80.}$$

$$70 : 30 :: 63 : \frac{63 \times 30}{70} = 27 \text{ gallons, the required quantity of brandy @ \$2.90.}$$

Page 289.

(4)

$$1974.80 \times \frac{1}{2} = £740.55 = £740 \text{ 11s.}$$

(5)

$$765.43 \times \frac{1}{2} = £306.172 = £306 \text{ 3s. } 5\frac{1}{2}\text{d.}$$

(6)

$$8172.19 \times \frac{1}{4} = £2043.0475 = £2043 \text{ 0s. } 11\frac{1}{2}\text{d.}$$

(9)

$$£743 \text{ 18s. 11d.} = £743.94583 \text{ and } 743.94583 \div \frac{3}{10} = \$2479.8194.$$

(10)

$$£119 \text{ 9s. } 8\frac{1}{2}\text{d.} = £119.484375 \text{ and } 119.484375 \div \frac{1}{4} = \$318.625.$$

(11)

$$£473 \text{ 17s. } 1\frac{1}{2}\text{d.} = £473.8572916, \text{ and } 473.8572916 \div \frac{1}{50} = \$2030.816964.$$

 Page 290.

(13)

$$1006.90 \div 4.867 = £206.88309 = £206 \text{ 17s. } 7\frac{1}{2}\text{d.}$$

(14)

$$916.87 \div 4.867 = £188.38504 = £188 \text{ 7s. } 8\frac{1}{2}\text{d.}$$

(15)

$$2114.81 \div 4.867 = £434.52023 = £334 \text{ 10s. } 4\frac{1}{2}\text{d.}$$

(17)

$$£2043 \text{ 11s. } 3\text{d.} = £2043.5625 \text{ and } 2043.5625 \times 4.867 = \$9946.01868.$$

(18)

$$£777 \text{ 7s. } 7\text{d.} = £777.37916 \text{ and } 777.37916 \times 4.867 = \$3783.50437.$$

(19)

$$£557 \text{ 19s. } 5\frac{1}{2}\text{d.} = £557.972916 \text{ and } 557.972916 \times 4.867 = \$2715.65418.$$

M

Page 294.

(4)

$$\$16785.25 \times 5.04 = 84597 \text{ francs } 66 \text{ centimes.}$$

(5)

Commercial value of the marc banco = 35 cents.

Add 1 per cent .35 "35.35

$$\text{Then } 35.35 \text{ cents} \times 4000 = \$1414.$$

(6)

$$\$35678 \times 1.0225 = \$36480.755.$$

(7)

The par value of 1 ruble = 75 cents.

Deduct 2 per cent 1.5 "73.5

$$\text{Then } 73.5 \text{ cents} \times 2560 = \$1881.60.$$

(8)

Old commercial par of £1 sterling = \$4.444 = \$4.44444

Add 8 per cent .35555\$4.79999

$$\text{Then } \$4.79999 \times 800 = \$3839.999 = \$3840.00.$$

Page 295.

(3)

£1 = 420d.

19½d. = 1 franc.

300 francs = 60 ducats.

1 ducat = 360 maravedis.

x = £1000.

$$x = \frac{84 \times 300 \times 1 \times 360 \times 1000}{1 \times 300} = 1,54138 \text{ maravedis by cir. ex.}$$

$$42\frac{1}{2}d. : £1000 :: 272 \text{ maravedis} : \frac{272 \times 1000 \times 20 \times 12}{42\frac{1}{2}} =$$

$$\frac{16}{272 \times 1000 \times 8 \times 12} = 1536000 \text{ maravedis by direct exchange.}$$

$$\text{Difference} = 1564138 - 1536000 = 28138 \text{ maravedis.}$$

$$34)28138$$

$$837 \text{ reals } 20 \text{ maravedis.}$$

$$103 \text{ piastres } 3 \text{ reals } 20 \text{ maravedis.}$$

(4)

Old commercial par of £1 sterling = \$4.444

To which add 10 per cent. of itself = .4444

Gives price of £1 sterling = \$4.8884

\$4888.40 ÷ \$4.8884 = £1000 = amount of bill he receives if he remits direct to London.

$$\left. \begin{array}{l} \$1 = 515 \text{ centimes.} \\ 2580 \text{ cen.} = £1 \text{ sterling.} \end{array} \right\} x = \frac{515 \times 4888.40}{2580} = £975.78526.$$

= £975 15s. 8½d. + = amount of bill he receives if he remits through Paris.

35 cents = 1 marc.

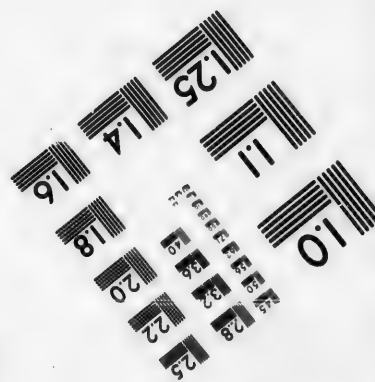
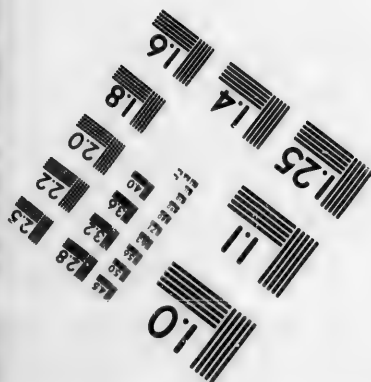
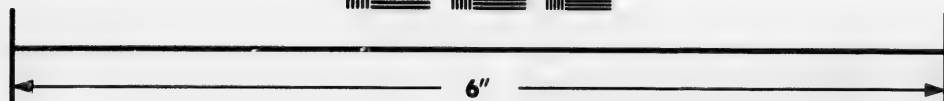
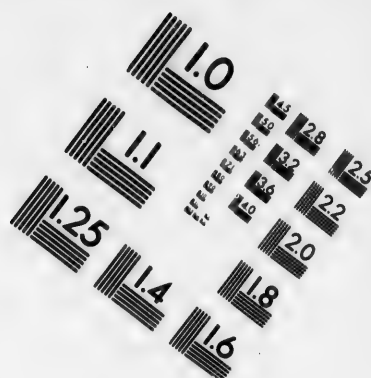
13½ marcs = £1 sterling.

$$x = \$4888.40.$$

$$x = \frac{4888.40}{.35 \times 13\frac{1}{2}} = \frac{391072}{385} = £1015.77142 = £1015 15s. 5d. + =$$

amount of bill he receives by remitting through Hamburg.





Photographic Sciences Corporation

**23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503**



(5)

$$\begin{array}{rcl}
 18 \text{ cents.} & = & 1 \text{ franc.} \\
 25 \text{ francs.} & = & 240 \text{d.} \\
 180 \text{d.} & = & 3 \text{ milrees.} \\
 5 \text{ milrees.} & = & 18 \text{ mares ban.} \\
 1200 \text{ mares ban.} & = & x
 \end{array}
 \left\{
 \begin{array}{l}
 x = \frac{18 \times 25 \times 180 \times 1200 \times 5}{240 \times 3 \times 18}
 \end{array}
 \right.$$

$= \$375 =$ circuitous exchange or sum he pays for 1200 marks.

$1200 \times .35 = \$420 =$ direct exchange or sum paid for 1200 marks. $\$420 - \$375 = \$45 =$ gain by circuitous exchange.

Page 298.

(3)

$$(3)^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243.$$

(4)

$$(20)^{10} = 20 \times 20 \times 20 \times 20 \times 20 \times 20 \times 20 \times 20 \times 20 \times 20 = 10240000000000.$$

(5)

$$(1.05)^6 = 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 \times 1.05 = 1.340095640625.$$

(6)

$$\left(\frac{3}{8}\right)^7 = \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} \times \frac{3}{8} = \frac{2187}{78128}.$$

(7)

$$\left(\frac{5}{9}\right)^5 = \frac{5}{9} \times \frac{5}{9} \times \frac{5}{9} \times \frac{5}{9} \times \frac{5}{9} = \frac{3125}{59049}.$$

(8)

$$11 = 11. \quad \left(\frac{57}{9}\right)^3 = \frac{57}{9} \times \frac{57}{9} \times \frac{57}{9} = \frac{185193}{729} = 1481\frac{68}{729}.$$

Page 299.

(9)

$$4^3 \times 4^4 \times 4^5 \times 4^7 = 4^2 + 4 + 5 + 7 = 4^{18}.$$

(10)

$$13^{11} \div 13^2 = 13^{11-2} = 13^9.$$

(11)

$$(3^3)^5 = 3^3 \times 5 = 3^{15}.$$

(12)

$$\{(7^4 \times 7^3) \div (7^2 \times 7^2)\}^6 = \{(7^4 + 3) \div (7^2 + 2)\}^6 = \\ \{7^7 \div 7^4\}^6 = (7^{7-4})^6 = (7^3)^6 = 7^{3 \times 6} = 7^{18}.$$

(13)

$$\{(5^3 \times 5^4 \times 5^{11} \times 5^9) \div (5^3 \times 5^2 \times 5^7 \times 5^5)\}^3 = \\ \{(5^{3+4+11+9}) \div (5^{3+2+7+5})\}^3 = \{5^{27} \div 5^{17}\}^3 = \\ (5^{27-17})^3 = (5^{10})^3 = 5^{10 \times 3} = 5^{30}.$$

Page 304.

(4)

$$\begin{array}{r} 195364(442 \\ 16 \\ \hline 84)353 \\ 336 \\ \hline 882)1764 \\ 1764 \end{array}$$

(5)

$$\begin{array}{r} .0676(.26 \\ 4 \\ \hline 46)276 \\ 276 \end{array}$$

(6)

$$\begin{array}{r} 984064(992 \\ 81 \\ \hline 189)1740 \\ 1701 \\ \hline 1982)3964 \\ 3964 \end{array}$$

$$5 \times 180 \times 1200 \times 5$$

$$240 \times 3 \times 18$$

for 1200 marks.

m paid for 1200

tous exchange.

243.

$$0 \times 20 \times 20 \times 20$$

$$1.05 \times 1.05 =$$

$$= \frac{2187}{78125}.$$

$$\frac{125}{9049}.$$

$$\frac{123}{6} = 1481 \frac{58}{123}.$$

(7)

$$\begin{array}{r}
 5 \cdot 0000000000(2 \cdot 23606 \\
 4 \\
 \hline
 42)1 \cdot 00 \\
 \cdot 84 \\
 \hline
 443) \cdot 1600 \\
 \cdot 1329 \\
 \hline
 4466)27100 \\
 26796 \\
 \hline
 447206)3040000 \\
 2683236 \\
 \hline
 356764
 \end{array}$$

(8)

$$\begin{array}{r}
 500000000000(\cdot 707106 \\
 49 \\
 \hline
 1407)10000 \\
 9849 \\
 \hline
 14141)15100 \\
 14141 \\
 \hline
 1414206)9590000 \\
 8485236 \\
 \hline
 1104764
 \end{array}$$

(9)

$$\begin{array}{r}
 60 \cdot 487129(7 \cdot 777 \\
 49 \\
 \hline
 147)1148 \\
 1029 \\
 \hline
 1547)11971 \\
 10829 \\
 \hline
 15547)114229 \\
 108829 \\
 \hline
 5400
 \end{array}$$

(10)

$$\begin{array}{r}
 79792266297612001(282475249 \\
 4 \\
 \hline
 48)397 \\
 384 \\
 \hline
 562)1392 \\
 1124 \\
 \hline
 5644)26826 \\
 22576 \\
 \hline
 56487)425062 \\
 395409 \\
 \hline
 564945)2965397 \\
 2824725 \\
 \hline
 5649502)14067261 \\
 11299094 \\
 \hline
 56495044)276825720 \\
 225980176 \\
 \hline
 564950489)5084554401 \\
 5084554401
 \end{array}$$

(11)

$$\begin{array}{r}
 0000012321(\cdot 00111 \\
 1 \\
 \hline
 21)23 \\
 21 \\
 \hline
 221)221 \\
 221
 \end{array}$$

$$\begin{array}{r}
 5649502)14067261 \\
 11299094 \\
 \hline
 56495044)276825720 \\
 225980176 \\
 \hline
 564950489)5084554401 \\
 5084554401
 \end{array}$$

(14)

$$\dot{i} = \frac{1}{9} \text{ and } \sqrt{\frac{1}{9}} = \frac{1}{3}.$$

(16)

$$5\frac{1}{2} = 5.142857142857 \text{ and } \sqrt{5.142857142857} = 2.267786.$$

(17)

$$3\frac{1}{3} = .4033457230 \text{ and } \sqrt{.4033457230} = .63509.$$

(18)

$$13\frac{1}{2} = 13.2 \text{ and } \sqrt{13.2} = 3.633.$$

 Page 305.

(20)

$$\begin{array}{r} \cdot\cdot\cdot\cdot\cdot \\ 11333311(2626 \\ \quad 4 \\ - \\ 46)433 \\ \quad 411 \\ - \\ 552)2233 \\ \quad 1434 \\ - \\ 5546)46611 \\ \quad 46811 \end{array}$$

(21)

$$\begin{array}{r} \cdot\cdot\cdot\cdot\cdot \\ 33233344(4344 \\ \quad 24 \\ - \\ 123)523 \\ \quad 413 \\ - \\ 1304)11033 \\ \quad 10024 \\ - \\ 13124)100544 \\ \quad 100544 \end{array}$$

(22)

$$\begin{array}{r}
 \cdot\cdot\cdot\cdot\cdot\cdot \\
 4234 \cdot 101230 (43 \cdot 412 \\
 \underline{31} \\
 133)1134 \\
 \underline{1004} \\
 1414)130 \cdot 10 \\
 \underline{122 \cdot 21} \\
 14231)2 \cdot 3412 \\
 \underline{1 \cdot 4231} \\
 142322) \cdot 413130 \\
 \underline{\cdot 340144} \\
 22431
 \end{array}$$

(23)

$$\begin{array}{r}
 \cdot\cdot\cdot\cdot\cdot\cdot \\
 888888 \cdot 8880 (888 \cdot 88 \\
 \underline{71} \\
 178)1788 \\
 \underline{1601} \\
 1878)18788 \\
 \underline{16801} \\
 18878)1887 \cdot 88 \\
 \underline{1688 \cdot 01} \\
 188878)188 \cdot 8780 \\
 \underline{168 \cdot 8801} \\
 18 \cdot 8878
 \end{array}$$

(24)

$$\begin{array}{r}
 \cdot\cdot\cdot\cdot\cdot\cdot \\
 248664e t 69 (54373 \\
 \underline{21} \\
 t4)386 \\
 \underline{354} \\
 t83)3264 \\
 \underline{2809} \\
 t867)657e t \\
 \underline{62e t 1} \\
 t8723)281969 \\
 \underline{281969}
 \end{array}$$

Page 307.

(27)

$$\begin{array}{r}
 100^2 = 10000 \\
 60^2 = 3600 \\
 \hline
 \end{array}$$

$$\text{Difference} = 6400 \text{ and } \sqrt{6400} = 80.$$

(28)

$$50^2 = 2500$$

$$80^2 = 6400$$

$$\text{Sum} = 8900 \text{ and } \sqrt{8900} = 94.34 \text{ nearly.}$$

(29)

$$24^2 = 576 \div 2 = 288 \text{ and } \sqrt{288} = 16.97.$$

(30)

$$36^2 = 1296$$

$$20^2 = 400$$

$$\text{Difference} = 896 \text{ and } \sqrt{896} = 29.933.$$

(31)

$$40^2 = 1600$$

$$14^2 = 196$$

$$\text{Difference} = 1404 \text{ and } \sqrt{1404} = 37.469.$$

$$40^2 = 1600$$

$$26^2 = 676$$

$$\text{Difference} = 924 \text{ and } \sqrt{924} = 30.397.$$

$$37.469 + 30.397 = 67.866 \text{ and } 67.866 \div 3 = 22.622.$$

(32)

$$1760 \text{ sq. yds.} = 15840 \text{ sq. ft. and } \sqrt{15840} = 125.857.$$

(33)

$$\sqrt{141376} = 376.$$

(34)

$$3^2 = 9$$

$$3^2 = 9$$

$$\text{Sum} = 18 \text{ and } \sqrt{18} = 4.24264.$$

(35)

$$16^2 = 256$$

$$12^2 = 144$$

$$\text{Sum} = 400 \text{ and } \sqrt{400} = 20.$$

(36)

$$3^2 + 3^2 + 3^2 = 27 \text{ and } \sqrt{27} = 5.196.$$

(37)

$$\left(\frac{1}{100}\right)^2 = \frac{1}{10000} \text{ and } (1)^2 = 1.$$

$$\text{Then } \frac{1}{100} : 1 :: 450 : \frac{450}{100} = 45000.$$

(38)

$$1 \text{ sq. acre} = 160 \text{ sq. perches. } 160 \div 3.1416 = 50.929462 \text{ and } \sqrt{50.929462} = 7.136.$$

Page 311.

(2)

	62712728317(3973
	27
	<hr style="width: 10%; margin: 0;"/>
$3^2 \times 300 =$	2700
$3 \times 9 \times 30 =$	810
$9^2 =$	81
	<hr style="width: 10%; margin: 0;"/>
	3591
	<hr style="width: 10%; margin: 0;"/>
$39^2 \times 300 =$	456300
$39 \times 7 \times 30 =$	8190
$7^2 =$	49
	<hr style="width: 10%; margin: 0;"/>
	464539
	<hr style="width: 10%; margin: 0;"/>
$397^2 \times 300 =$	47282700
$397 \times 3 \times 30 =$	35730
$3^2 =$	9
	<hr style="width: 10%; margin: 0;"/>
	47318439
	<hr style="width: 10%; margin: 0;"/>
	35712
	<hr style="width: 10%; margin: 0;"/>
	32319
	<hr style="width: 10%; margin: 0;"/>
	3393728
	<hr style="width: 10%; margin: 0;"/>
	3251773
	<hr style="width: 10%; margin: 0;"/>
	141955317
	<hr style="width: 10%; margin: 0;"/>
	141955317

(3)

$$\begin{array}{rcl} 1^2 \times 300 & = & 300 \\ 1 \times 2 \times 30 & = & 60 \\ 2^2 & = & 4 \end{array}$$

 364

$$\begin{array}{rcl} 12^2 \times 300 & = & 43200 \\ 12 \times 5 \times 30 & = & 1800 \\ 5^2 & = & 25 \end{array}$$

 45025

1953125(125

1

 953

728

 225125

225125

(4)

$$\begin{array}{rcl} 1^2 \times 300 & = & 300 \\ 10^2 \times 300 & = & 30000 \\ 10 \times 2 \times 30 & = & 600 \\ 2^2 & = & 4 \end{array}$$

 30604

$$\begin{array}{rcl} 102^2 \times 300 & = & 3121200 \\ 102 \times 5 \times 30 & = & 15300 \\ 5^2 & = & 25 \end{array}$$

 3136525

1076890625(1025

1

 76

76890

61208

 15682625

15682625

(5)

$$\begin{array}{r}
 8^2 \times 300 = 19200 \\
 8 \times 8 \times 30 = 1920 \\
 8^2 = 64 \\
 \hline
 21184 \\
 88^2 \times 300 = 2323200 \\
 88 \times 7 \times 30 = 18480 \\
 7^2 = 49 \\
 \hline
 2341729
 \end{array}$$

$$\begin{array}{r}
 \cdot 697864103(\cdot 887 \\
 512 \\
 \hline
 185864 \\
 169472 \\
 \hline
 16392103 \\
 16392103
 \end{array}$$

(6)

$$\begin{array}{r}
 4^2 \times 300 = 4800 \\
 4 \times 6 \times 30 = 720 \\
 6^2 = 36 \\
 \hline
 5556 \\
 46^2 \times 300 = 634800 \\
 46 \times 8 \times 30 = 11040 \\
 8^2 = 64 \\
 \hline
 645904
 \end{array}$$

$$\begin{array}{r}
 \cdot 102503 \cdot 232(46 \cdot 8 \\
 64 \\
 \hline
 38503 \\
 33336 \\
 \hline
 5167 \cdot 232 \\
 5167 \cdot 232
 \end{array}$$

(7)

$$179597 \cdot 069288 (56 \cdot 42.$$

125

$$54537$$

$$5^2 \times 300 = 7500$$

$$5 \times 6 \times 30 = 900$$

$$6^2 = 36$$

$$8436$$

$$50616$$

$$56^2 \times 300 = 940800$$

$$56 \times 4 \times 30 = 6720$$

$$4^2 = 16$$

$$947536$$

$$3790 \cdot 144$$

$$564^2 \times 300 = 95428800$$

$$564 \times 2 \times 30 = 33840$$

$$2^2 = 4$$

$$190 \cdot 925288$$

$$95462644$$

$$190 \cdot 925288$$

(8)

$$483 \cdot 736625 (7 \cdot 85.$$

343

$$140 \cdot 736$$

$$7^2 \times 300 = 14700$$

$$7 \times 8 \times 30 = 1680$$

$$8^2 = 64$$

$$16444$$

$$131 \cdot 552$$

$$78^2 \times 300 = 1825200$$

$$78 \times 5 \times 30 = 11700$$

$$5^2 = 25$$

$$9 \cdot 184625$$

$$1836925$$

$$9 \cdot 184625$$

(9)

$$\begin{array}{r}
 8^2 \times 300 = 19200 \\
 8 \times 6 \times 30 = 1440 \\
 6^2 = 36 \\
 \hline
 20676
 \end{array}
 \qquad
 \begin{array}{r}
 .636056(\cdot 86. \\
 512 \\
 \hline
 124056 \\
 \\
 124056
 \end{array}$$

Page 312.

(12)

$$\frac{2}{19} = .105263157894+ \text{ and } \sqrt[3]{.105263157894} = .4721.$$

(13)

$$\frac{2}{17} = .176470588235+ \text{ and } \sqrt[3]{.176470588235} = .5609.$$

(14)

$$\frac{1}{4} \text{ of } 2\frac{1}{2} = \frac{5}{8} = .83333333+ \text{ and } \sqrt[3]{.83333333} = .941.$$

(15)

$$28\frac{1}{2} = 28.75 \text{ and } \sqrt[3]{28.75} = 3.063.$$

(16)

$$32\frac{2}{11} = 32.\ddot{72} \text{ and } \sqrt[3]{32.\ddot{72}} = 3.198.$$

165
1651653²=
1653×

Page 313.

(18)

One million = 33233344 senary.

33233344(244.

12

21233

$$\begin{array}{rcl} 2^2 & = & 4 \times 300 = 1200 \\ 2 \times 30 & = & 100 \times 4 = 400 \\ 4^2 & = & 24 \end{array}$$

2424

14544

$$\begin{array}{rcl} 24^2 & = & 1104 \times 300 = 332000 \\ 24 \times 30 & = & 1200 \times 4 = 5200 \\ 4^2 & = & 24 \end{array}$$

2245344

341224

2245344

(19)

6131271·000000(165·32.

1

5131

$$\begin{array}{rcl} 1^2 & \times & 300 = 300 \\ 1 \times 30 & \times & 6 = 220 \\ 6^2 & = & 44 \end{array}$$

564

4270

$$\begin{array}{rcl} 16^2 & = & 304 \times 300 = 91200 \\ 16 \times 30 & = & 520 \times 5 = 2600 \\ 5^2 & = & 31 \end{array}$$

114651

600115

333 = ·941.

$$\begin{array}{rcl} 165^2 & = & 32571 \times 300 = 9771300 \\ 165 \times 30 & = & 5370 \times 3 = 16110 \\ 3^2 & = & 11 \end{array}$$

12035661

36131·423

3.

$$\begin{array}{rcl} 1653^2 & = & 3272071 \times 300 = 981621300 \\ 1653 \times 30 & = & 54010 \times 2 = 108020 \\ 2^2 & = & 4 \end{array}$$

1205755324

2413·732650

98.

406·422130

(20)

10221012·102000000

1 $\overline{112 \cdot 012} = \text{root.}$

$1 \times 1000 =$	1000	2221
$1 \times 1 \times 100 =$	100	
$1^2 =$	1	
	<u>1101</u>	1101
$11^2 = 121 \times 1000 =$	121000	1120012
$11 \times 100 = 1100 \times 2 =$	2200	
$2^2 =$	11	
	<u>200211</u>	1101122
$112^2 = 21021 \times 1000 =$	21021000	11120·102
$1120^2 = 2102100 \times 1000 =$	2102100000	11120·102000
$1120 \times 100 = 112000 \times 1 =$	112000	
$1^2 =$	1	
	<u>2102212001</u>	2102·212001
$11201^2 = 211010101 \times 1000 =$	211010101000	2010·112222000
$11201 \times 100 = 1120100 \times 2 =$	10010200	
$2^2 =$	11	
	<u>211020111211</u>	1122·111000122
		<u>111·001221101</u>

44² =
 440² = 4
 4400² = 4
 4400 × 30

(21)

$$\begin{array}{r} \text{teteet} \cdot 000000 (\text{e}7 \cdot \text{t}3. \\ 92\text{e} \end{array}$$

$$\begin{array}{r} \text{e}^2 = \text{t}1 \times 300 = 26300 \\ \text{e} \times 30 = 290 \times 7 = 1730 \\ 7^2 = 41 \end{array}$$

18eet

27t71

167217

$$\begin{array}{r} \text{e}7^2 = \text{e}221 \times 300 = 2966300 \\ \text{e}7 \times 30 = 2\text{t}90 \times \text{t} = 24\text{e}60 \\ \text{t}^2 = 84 \end{array}$$

249t3.000

298e324

24154.7e4

$$\begin{array}{r} \text{e}7\text{t}^2 = \text{e}39544 \times 300 = 29\text{e}441000 \\ \text{e}7\text{t} \times 30 = \text{te}60 \times 2 = 19\text{e}20 \\ 3^2 = 4 \end{array}$$

84t.408000

29e45te24

57t.8e9t48

28e.70t174

(22)

$$\begin{array}{r} 421030 \cdot 441200000 (44 \cdot 004 \\ 224 \end{array}$$

$$\begin{array}{r} 4^2 = 31 \times 300 = 14300 \\ 4 \times 30 = 220 \times 4 = 1430 \\ 4^2 = 31 \end{array}$$

142030

21311

141244

$$\begin{array}{r} 44^2 = 4301 \times 300 = 2340300 \\ 440^2 = 430100 \times 300 = 234030000 \\ 4400^2 = 43010000 \times 300 = 23403000000 \\ 4400 \times 30 = 242000 \times 4 = 2123000 \\ 4^2 = 31 \end{array}$$

231.441

231.441000

231.441000000

23410123031

210.141t02224

21.244342221

N

Page 314.

(25)

$$3^3 : 6^3 :: 4 \text{ lbs.} : \text{Ans.} = 32 \text{ lbs.}$$

(26)

$$1^3 : \left(\frac{1}{2}\right)^3 :: \$120 : \text{Ans.} = \$5145.$$

(27)

$$\begin{aligned} (70)^3 : (4\frac{1}{2})^3 &:: 180 \text{ lbs.} : \text{Ans.} \\ 343000 : 241804367 &:: 180 : \text{Ans.} = \\ 180 \times \frac{241804367}{125} \times \frac{1}{343000} &= 1015.1 \text{ lbs.} \end{aligned}$$

(28)

$$973^3 = 921167317$$

$$45^3 = 91125$$

$$62^3 = 238328$$

$$30^3 = 27000$$

$$80^3 = 512000$$

$$20^3 = 8000$$

$$\begin{aligned} 9221167317 - (91125 + 238328 + 27000 + 512000 + 8000) &= \\ 920290864 \text{ and } \sqrt[3]{920290864} &= 972.69. \end{aligned}$$

(29)

$$8 \text{ feet } 3 \text{ inches} = 99 \text{ inches, } 3 \text{ feet} = 36 \text{ inches, and } 2 \text{ feet } 7 \text{ inches} = 31 \text{ inches.}$$

$$99 \times 36 \times 31 = 110484 \text{ and } \sqrt[3]{110484} = 47.9843.$$

(30)

After the first has wound off her portion, there will remain of the thread.

Then the whole ball : part remaining :: cube of diameter of whole ball : cube of diameter of part remaining.

That is, $1 : \frac{1}{4} :: 3^3 : x^3$, and hence $x = 3 \times \sqrt[3]{\frac{1}{4}} = 3 \times \sqrt[3]{.75} = .90856 \times 3 = 2.72568 =$ diameter of the ball after the first has wound off her portion.

Similarly after the second has wound off her portion, there will remain $\frac{1}{4}$ of the ball, and after the third has taken her portion, $\frac{1}{4}$ of the ball.

Hence $1 : \frac{1}{4} :: 3^3 : x^3$, whence $x = 3 \times \sqrt[3]{\frac{1}{4}} = 3 \times \sqrt[3]{.5} = 3 \times .79370 = 2.38110 =$ diameter after the second has taken her portion.

$1 : \frac{1}{4} :: 3^3 : x^3$, whence $x = 3 \times \sqrt[3]{\frac{1}{4}} = 3 \times \sqrt[3]{.25} = 3 \times .62996 = 1.88988 =$ diameter after the third has taken her portion.

Hence 1st takes off 3	— 2.72568 =	.27432 inches.
2nd " "	2.72568 —	2.38110 = .34458 "
3rd " "	2.38110 —	1.88988 = .49122 "
4th " "	remaining	1.88988 "

Page 315.

(1)

$$\sqrt{19987173376} = 141376, \text{ and } \sqrt{141376} = 376.$$

(2)

$$\sqrt[3]{308915776} = 676, \text{ and } \sqrt{676} = 26.$$

(3)

$$\sqrt[3]{40353607} = 343, \text{ and } \sqrt{343} = 7.$$

(4)

$$\sqrt[3]{387420489} = 729, \sqrt[3]{729} = 9, \text{ and } \sqrt{9} = 3.$$

(5)

$$\sqrt[3]{134217728} = 512, \sqrt[3]{512} = 8, \text{ and } \sqrt[3]{8} = 2.$$

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(13)

The mantissa of the logarithm of 8193 (the first four digits) = .913443, and the next following mantissa is .913496.

Then from .913496

Subtract .. .913443

Difference, 53; and 53×217 (remaining digits of given number) = 11501, from which we cut off three digits, since we multiplied by a number of three digits, and since the highest digit cut off is not less than 5, we add unity to the part retained, which gives us 12.

Then mantissa of logarithm of first four digits .913443

Add, 12

Mantissa of logarithm of given number, .913455

To which attach the characteristic 6 and required logarithm = 6.913455.

The mantissa of the logarithm of 7392 (the first four digits) = .868762, and the next following mantissa is .868821.

Then from .868821

Subtract .. .868762

Difference, 59; and 59×45 (remaining digits of given number) = 2655, from which we cut off two digits, since we multiplied by a number of two digits, and since the highest digit cut off is not less than 5, we add unity to the part retained, which gives us 27.

Then mantissa of logarithm of first four digits, .868762

Add, 27

Mantissa of logarithm of given number, .868789

(Continued on next page.)

(13 continued.)

To which attach the characteristic 1 and required logarithm =
1.868789.

The mantissa of the logarithm of 8437 (the first four digits)
= .926188, and the next following mantissa is .926240.

Then from .926240

Subtract .. .926188

Difference, 52; and 52×42 (remaining digits of given
number) = 2184, from which we cut off two digits, since we
multiplied by a number of two digits, and since the highest digit
cut off is not less than 5, we add unity to the part retained,
which becomes 22.

Then mantissa of logarithm of first four digits .926188
Add, 22

Mantissa of logarithm of given number, .926210

To which attach the characteristic 1 and required logarithm =
1.926210.

(14)

The mantissa of the logarithm of 2345 = .370143, and the next
following mantissa is .370338.

Then from .370338

Subtract .. .370143

Difference, 185; and $185 \times 64 = 11840$, from which we
cut off two digits, since we multiplied by a number of two
digits, which gives us 118.

Then mantissa of logarithm of 2345 = .370143

Add, 118

Mantissa of logarithm of given number = .370261

To which attach the characteristic 4 and required logarithm =
4.370261.

(Continued on next page.)

(14 continued.)

The mantissa of the logarithm of 1007 = .003029, and the next following mantissa is .003461.

Then from .003461

Subtract.. .003029

Difference, 432; and $432 \times 013 = 5616$, from which we cut off three digits, since we multiplied by a number of three digits, and since the highest digit cut off is not less than 5, we add unity to the part retained, which gives us 6.

Then mantissa of logarithm of 1007 = .003029

Add, 6

Mantissa of logarithm of given number .003035

To which attach the characteristic $\bar{3}$ and required logarithm = $\bar{3}.003035$.

(15)

Mantissa of logarithm of 5237..... .719083

Difference from column D = 83; and $83 \times 6 = 498$

from which we cut off 1 digit and add..... 50

And also attach the characteristic 1, and required

logarithm = 1.719133

Mantissa of logarithm of 1294..... .111934

Difference from column D = 335; and $335 \times 76 =$

25460 from which we cut off two digits and add, 255

And also attach the characteristic 2 and required

logarithm = 2.112189

(16)

Mantissa of logarithm of	·0004713	=	·673297
P. P. corresponding to	·00000009	=	83
P. P. " to	·000000008	=	74

Sum, = ·6733874

Therefore required mantissa = ·673387 and required logarithm
= 4·673387.

Mantissa of logarithm of	9136000	=	·960756
P. P. corresponding to	700	=	33
P. P. " to	10	=	5
P. P. " to	2	=	9

Sum, = ·96078959

Therefore required mantissa = ·960790 and required logarithm
= 6·960790.

(17)

Mantissa of logarithm of	4·23400	=	·626751
P. P. corresponding to	20	=	20
P. P. " to	9	=	92

Sum, = ·6267802

Therefore required logarithm is 0·626780.

Mantissa of logarithm of	763·1	=	·882581
P. P. corresponding to	·02	=	11
P. P. " to	·009	=	51
P. P. " to	·0008	=	46
P. P. " to	·00007	=	40

Sum, = ·882597600

Therefore required logarithm is 2·882598.

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(20)

Given logarithm, $\cdot 137139$ Next lower in table, $\cdot 137037 = \log.$ of 1371.Difference $\quad \quad \quad 102$, Tabular difference $= 316$.

Then $1020000 \div 316$ gives 3227 for digits in 5th, 6th, 7th, and 8th places.

Hence the digits of the natural number are 13713227; and since the characteristic is 4, i. e., one less than the number of digits to the left of the decimal point, the required number is 13713·227.

Given logarithm, $\cdot 718134$ Next lower in table, $\cdot 718086 = \log.$ of 5225.Difference, $\quad \quad \quad 48$, Tabular difference $= 83$.

Then $48000 \div 83$ gives 578 for digits in 5th, 6th and 7th places.

Hence the digits of the natural number are 5225578, and since the characteristic is 0, i. e., one less than the number of digits to the left of the decimal point, the required number is 5·225578.

Given logarithm, $\cdot 635421$ Next lower in table, $\cdot 635383 = \log.$ of 4319.Difference, $\quad \quad \quad 38$, Tabular difference $= 101$.

Then $38000 \div 101$ gives 376 for digits in 5th, 6th, and 7th places.

Hence the digits of the natural number are 4319376, and since the characteristic is $\bar{4}$, i. e., one more than the number of ciphers between the decimal point and the first figure to the right, the required number is $\cdot 0004319376$.

(21)

Given log. $\cdot 921686 = \log.$ of 8350.

And since the characteristic is 2, i. e., one less than the number of digits to the left of the decimal point, the required number is 835.

Given logarithm, $\cdot 922165$

Next lower in table, $\cdot 922154 = \log.$ of 8359.

Difference =

11, Tabular difference = 52.

Then $11000 \div 52$ gives 211 for digits in 5th, 6th, and 7th places.

Hence the digits of the natural number are 8359211; and since the characteristic is $\bar{1}$, i. e., one more than the number of ciphers between the decimal point and first figure to the right, the required number is $\cdot 8359211$.

(22)

Given logarithm,

$\cdot 407968$

Next lower in table,

$\cdot 407901 = \log.$ of 2558.

Difference, =

67

Highest P.P. not greater than 67 = 51 corresponds to 3 for 5th place.

160

Highest P.P. not greater than 160 = 153 corresponds to 9 for 6th place.

70

Highest P.P. not greater than 70 = 68 corresponds to 4 for 7th place.

2

Therefore digits of required number are 2558394; and since the characteristic is 5, there must be six digits to the left of the decimal point.

Hence required number is 255839.4.

(Continued on next page.)

(22 continued.)

Given logarithm,	$\cdot 408386$	
Next lower in table,	$\cdot 408240 = \log. \text{ of } 2560.$	
Difference, =	<u>146</u>	
Highest P.P. not greater than 146 =	<u>136</u>	corresponds to 8 in 5th place.
	100	
Highest P.P. not greater than 100 =	<u>85</u>	corresponds to 5 in 6th place.
	150	
Highest P.P. not greater than 150 =	<u>136</u>	corresponds to 8 in 7th place.
	140	
Highest P.P. not greater than 140 =	<u>136</u>	corresponds to 8 in 8th place.

Therefore digits of required number are 25608588 ; and since the characteristic is 7, there must be eight digits to the left of the decimal point.

Hence required number is 25608588.

Given logarithm,	$\cdot 416369$	
Next lower in table,	$\cdot 416308 = \log. \text{ of } 2608.$	
Difference, =	<u>61</u>	
Highest P.P. not greater than 61 =	<u>49</u>	corresponds to 3 in 5th place.
	12	

Therefore digits of required number are 26083 ; and since the characteristic is $\bar{3}$, there must be two ciphers between the decimal point and first figure.

Hence required number is $\cdot 0026083$.

(23)

Given logarithm,

 $\cdot 877777$

Next lower in table,

 $\cdot 877774 = \log. \text{ of } 7547.$

Difference =

 $\underline{\hspace{1cm}}$
3

There is no P.P. not greater than 3

0 corresponds to 0 in
5th place. $\underline{\hspace{1cm}}$
30

Highest P.P. not greater than 30 =

29 corresponds to 5 in
6th place. $\underline{\hspace{1cm}}$
10

Highest P.P. not greater than 10 =

6 corresponds to 1
in 7th place. $\underline{\hspace{1cm}}$
40

Highest P.P. not greater than 40 =

35 corresponds to 6
in 8th place. $\underline{\hspace{1cm}}$
50

Highest P.P. not greater than 50 =

46 corresponds to
8 in 9th place. $\underline{\hspace{1cm}}$
4

Therefore digits of required number are 754705168 ; and since the characteristic is 4, there must be five digits to the left of the decimal point.

Hence required number is 75470·5168.

Given logarithm,

 $\cdot 555555$

Next lower in table,

 $\cdot 555457 = \log. \text{ of } 3593.$

Difference, =

 $\underline{\hspace{1cm}}$
98

Highest P.P. not greater than 98 =

98 corresponds to 8 in
5th place.

Therefore digits of required number are 35938 ; and since the characteristic is 0, there must be one digit to the left of the decimal point.

Hence required number is 3·5938.

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(1)

$$10 - 5.631642 = 4.368358.$$

$$10 - 0.714000 = 9.286000.$$

(2)

$$10 - \bar{3}.123456 = 12.876544.$$

$$10 - \bar{7}.213149 = 16.786851.$$

(3)

$$10 - 6.124357 = 3.875643 \text{ and } 10 - 2.000837 = 11.999163.$$

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(5)

$$\text{Logarithm of } 61 = 1.785330$$

$$\text{" } 22 = 1.342423$$

$$\text{" } 65 = 1.812913$$

$$\text{Sum} = 4.940666 = \text{logarithm of } 87230.$$

(6)

$$\text{Logarithm of } 52 = 1.716003$$

$$\text{" } 734 = 2.865696$$

$$\text{" } 6 = 0.778151$$

$$\text{Sum} = 5.359850$$

$$5.359835 = \text{logarithm of } 229000$$

$$15 =$$

7

$$\text{Ans. } 229007$$

(7)

$$\text{Logarithm of } 35.86 = 1.554610$$

$$" \quad 2.1046 = 0.323169$$

$$" \quad .8372 = \bar{1}.922829$$

$$" \quad .00294 = \bar{3}.468347$$

$$\text{Sum} = \begin{array}{r} \bar{1}.268955 \\ \bar{1}.268812 \\ \hline \end{array} = \text{logarithm of } .185700$$

$$143 = \quad \quad \quad 61$$

$$\text{Ans. } .185761$$

(8)

$$\text{Log. of } .00008764 = \bar{5}.942702$$

$$" \quad .86359 = \bar{1}.936308$$

$$\text{Sum} = \begin{array}{r} \bar{5}.879010 \\ \hline \end{array}$$

$$\bar{5}.878981 = \text{logarithm of } .000075680$$

$$29 = \quad \quad \quad 5$$

$$\text{Sum } .000075685$$

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(11)

$$\text{Logarithm of } .6734 = \bar{1}.828273$$

$$" \quad .0009278 = \bar{4}.967454$$

$$\text{Difference} = \begin{array}{r} 2.860819 \\ \hline \end{array}$$

$$2.860817 = \text{logarithm of } 725.8000$$

$$2 = \quad \quad \quad 33$$

$$\text{Ans. } 725.8033$$

(12)

$$\text{Logarithm of } 437.89 = 2.641365$$

$$\text{" } 62.735 = 1.797510$$

$$\text{Difference} = \underline{.843855} = \text{logarithm of } 6.98$$

(13)

$$\text{Logarithm of } 93.217 = 1.969495$$

$$\text{" } .0007132 = \underline{.853211}$$

$$\text{Difference} = 5.116284$$

$$\underline{5.116276} = \text{logarithm of } 130700.0$$

$$\underline{8} = \underline{2.4}$$

$$\text{Ans. } 130702.4$$

(14)

$$\text{Logarithm of } 23 = 1.361728$$

$$\text{" } 189 = 2.276462$$

$$\text{" } 2.748 = \underline{0.439017}$$

$$\text{Sum} = 4.077207$$

$$\text{Logarithm of } 9835267 = 6.992786$$

$$\underline{4.077207}$$

$$\text{Difference} = 2.915579$$

$$\underline{2.915558} = \text{logarithm of } 823.300$$

$$\underline{21} = \underline{39}$$

$$\text{Ans. } 823.339$$

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(17)

$$\text{Logarithm of } 5 = 0.698970.$$

$$\text{Then } 0.698970 \times 5 = 3.494850 = \text{logarithm of } 3125.$$

(18)

Logarithm of 1.073 = .030600.

Then $.030600 \times 6 = .183600 = \text{logarithm of } 1.5261.$

(19)

Logarithm of .0279 = $\bar{2}.445604.$

Then $\bar{2}.4450604 \times 4 = \bar{7}.782416 = \text{logarithm of } .00000060592.$

(20)

Logarithm of 1.111 = .045714.

Then $.045714 \times 11 = .502854 = \text{logarithm of } 3.1831.$

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(23)

Logarithm of 913426000 = 8.960673.

$8.960673 \div 7 = 1.2800961 = \text{logarithm of } 19.0588.$

(24)

Logarithm of 1.61342 = .207747.

$.207747 \div 11 = .01888609 = \text{logarithm of } 1.0444.$

(25)

Logarithm of .000007139 = $\bar{6}.853637 = \bar{10} + 4.853637.$

$(\bar{10} + 4.853637) \div 5 = \bar{2}.970727 = \text{logarithm of } .0934817.$

(26)

Logarithm of .002147 = $\bar{3}.331832 = \bar{7} + 4.331832.$

$(\bar{7} + 4.331832) \div 7 = \bar{1}.6188331 = \text{logarithm of } .41575.$

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(28)

$$14000 = 7 \times 2 \times 1000 \therefore \log. 14000 = (\log. 7) + (\log. 2) + (\log. 1000).$$

$$\text{Log. } 7 = 0.845098$$

$$\text{Log. } 2 = 0.301030$$

$$\text{Log. } 1000 = 3$$

$$\text{Sum, } = 4.146128 = \log. 14000$$

$$4.9 = 7^2 \div 10 \therefore \log. 4.9 = (\log. 7) \times 2 - (\log. 10).$$

$$\text{Log. } 7 = 0.845098 \times 2 = 1.690196$$

$$\text{Log. } 10 = 1$$

$$\text{Difference} = .690196 = \log. 4.9.$$

$$.00196 = 49 \times 4 \div 100000 = 7^2 \times 2^2 \div 100000$$

$$\therefore \log. .00196 = (\log. 7) \times 2 + (\log. 2) \times 2 - (\log. 100000).$$

$$\text{Log. } 7 = 0.845098 \times 2 = 1.690196$$

$$\text{Log. } 2 = 0.301030 \times 2 = 0.602060$$

$$\text{Sum} = 2.292256$$

$$\text{Log. of } 100000 = 5 \text{ and } 2.292256 - 5 = \bar{3}.292256 = \log. \text{ of } .00196.$$

$$\text{Since } 5 = 10 \div 2, \text{ the logarithm of } 5 = \log. 10 - \log. 2 = 1 - 0.301030 = 0.698970.$$

$$1750 = 5^2 \times 7 \times 10 \therefore \log. 1750 = (\log. 5) \times 2 + (\log. 7) + (\log. 10).$$

$$\text{Log. } 5 = 0.698970 \times 2 = 1.397940$$

$$\text{Log. } 7 = .845098$$

$$\text{Log. } 10 = 1$$

$$\text{Sum, } = 3.243038 = \log. \text{ of } 1750.$$

$$1428.571428 = \frac{1}{7} \times 10000 \therefore \log. 1428.571428 = (\log. \frac{1}{7}) + \log. 10000.$$

(Continued on next page.)

(28 continued.)

$$\text{Log. } \frac{1}{4} = (\text{log. } 1) - (\text{log. } 7) = 0 - 0.845098 = \bar{1}.154902$$

$$\text{Log. } 10000 = 4$$

$$\therefore \text{log. of } 1428.571428 = \text{sum} = 3.154902$$

$$.00000112 = 2^4 \times 7 \div 100000000 \therefore \text{log. } .00000112 =$$

$$(\text{log. } 2) \times 4 + (\text{log. } 7) - (\text{log. } 100000000).$$

$$\text{Log. } 2 = 0.301030 \times 4 = 1.204120$$

$$\text{Log. } 7 = 0.845098$$

$$\text{Sum} = 2.049218 = \text{and log. } 100000000 = 8$$

$$2.049218 - 8 = \bar{6}.049218 = \text{log. } .00000112$$

$$3.0625 = \frac{1}{16} \therefore \text{log. } 3.0625 = (\text{log. } 49) - (\text{log. } 16) =$$

$$(\text{log. } 7) \times 2 - (\text{log. } 4) \times 4.$$

$$\text{Log. } 7 = 0.845098 \times 2 = 1.690196$$

$$\text{Log. } 2 = 0.301030 \times 4 = 1.204120$$

$$\text{Difference} = 0.486076 = \text{log. of } 3.0625.$$

(29)

$$49\frac{1}{4} = \frac{99}{2} = 3^2 \times 11 \times \frac{1}{4} \therefore \text{log. } 49\frac{1}{4} = (\text{log. } 3) \times 2 + (\text{log. } 11) + (\text{log. } \frac{1}{4}).$$

$$\text{Log. } 3 = 0.477121 \times 2 = 0.954242$$

$$\text{Log. } 11 = 1.041393$$

$$\text{Log. } \frac{1}{4} = \bar{1}.698970$$

$$\text{Sum} = 1.694605 = \text{log. of } 49\frac{1}{4}.$$

$$363 = 11^2 \times 3 \therefore \text{log. } 363 = (\text{log. } 11) \times 2 + (\text{log. } 3).$$

$$\text{Log. } 11 = 1.041393 \times 2 = 2.082786$$

$$\text{Log. } 3 = 0.477121$$

$$\text{Sum} = 2.559906 = \text{log. of } 363.$$

$$\text{Log. } .5 \text{ or } \frac{1}{2} = \bar{1}.698970, \text{ and by altering the characteristic we get } 0.698970 \text{ for log. of } 5.$$

(Continued on next page.)

(29 continued.)

$$4 \cdot \ddot{0}9 = 4 \frac{1}{11} = \frac{44}{11} = 3^2 \times 5 \div 11 \therefore \log. 4 \cdot \ddot{0}9 = (\log. 3) \times 2 + (\log. 5) - (\log. 11).$$

$$\text{Log. 3} = \cdot 477121 \times 2 = 0 \cdot 954242$$

$$\text{Log. 5} = = \cdot 698970$$

$$1 \cdot 653212$$

$$\text{Log. 11} = 1 \cdot 041393 \text{ and } 1 \cdot 653212 - 1 \cdot 041393 = 0 \cdot 611819 = \text{log. of } 4 \cdot \ddot{0}9.$$

$$2 \cdot 4 = 2 \frac{2}{3} = \frac{2^2}{3} = 11 \times 2 \div 9 \therefore \log. 2 \cdot 4 = (\log. 11) + (\log. 2) - (\log. 3) \times 2.$$

$$\text{Log. 2} = (\log. 10) - (\log. 5) = 1 - 0 \cdot 698970 = 0 \cdot 301030.$$

$$\text{Log. 11} = 1 \cdot 041393$$

$$\text{Log. 2} = 0 \cdot 301030$$

$$1 \cdot 342423$$

$$\text{Log. 3} = 0 \cdot 477121 \times 2 = 0 \cdot 954242 \text{ and } 1 \cdot 342423 - 0 \cdot 954242 = 0 \cdot 388181 = \text{log. of } 2 \cdot 4.$$

$$392 \cdot \ddot{7}2 = 392 \frac{2}{11} = \frac{4312}{11} = 2^4 \times 3^3 \times 10 \div 11 \therefore \log. 392 \cdot \ddot{7}2 = (\log. 2) \times 4 + (\log. 3) \times 3 + (\log. 10) - (\log. 11).$$

$$\text{Log. 2} = 0 \cdot 301030 \times 4 = 1 \cdot 204120$$

$$\text{Log. 3} = 0 \cdot 477121 \times 3 = 1 \cdot 431363$$

$$\text{Log. 10} = 1$$

$$\text{Sum} = 3 \cdot 635483$$

$$\text{Log. 11} = 1 \cdot 041393 \text{ and } 3 \cdot 635483 - 1 \cdot 041393 = 2 \cdot 594090 = \text{log. of } 392 \cdot \ddot{7}2.$$

$$293333 \frac{1}{3} = \frac{880002}{3} = 2^3 \times 11 \times 10000 \div 3 \therefore \log. 293333 \frac{1}{3} = (\log. 2) \times 3 + (\log. 11) + (\log. 10000) - (\log. 3).$$

$$\text{Log. 2} = 0 \cdot 301030 \times 3 = 0 \cdot 903090$$

$$\text{Log. 11} = 1 \cdot 041393$$

$$\text{Log. 10000} = 4$$

$$\text{Sum} = 5 \cdot 944483$$

(Continued on next page.)

$$= (\log. 3) \times 2$$

$$954242$$

$$698970$$

$$653212$$

$$= 0.611819 =$$

$$\log. 11) + (\log.$$

$$70 = 0.301030.$$

$$\text{Log. } 3 = 0.477121 \text{ and } 5.944483 - 0.477121 = 5.467362 =$$

$$\log. \text{ of } 293333\frac{1}{3}.$$

$$19.965 = 11^3 \times 5 \times 3 \div 1000 \therefore \log. 19.965 = (\log. 11) \times 3$$

$$+ (\log. 5) + (\log. 3) - (\log. 1000).$$

$$\text{Log. } 11 = 1.041393 \times 3 = 3.124179$$

$$\text{Log. } 5 = 0.698970$$

$$\text{Log. } 3 = 0.477121$$

$$\text{Sum} = 4.300270$$

$$\text{Log. } 1000 = 3 \text{ and } 4.300270 - 3 = 1.300270 = \log. \text{ of } 19.965.$$

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(6)

Here we have given the first term 4, the number of terms 17, and the sum of the series 884, to find l , the last term.

$$\text{Then } l = \frac{2s}{n} - a = \frac{884 \times 2}{17} - 4 = 104 - 4 = 100.$$

(7)

Here we have given the first term 21, the last term 497 and the number of terms 41, to find the common difference.

$$\text{Then } d = \frac{l - a}{n - 1} = \frac{497 - 21}{41 - 1} = \frac{476}{40} = \frac{119}{10} = 11\frac{9}{10}.$$

(8)

Here we have given a , l , and d , to find n , and since $a = 12$, $l = 96$, and $d = 6$, we have

$$n = \frac{l - a}{d} + 1 = \frac{96 - 12}{6} + 1 = \frac{84}{6} + 1 = 14 + 1 = 15.$$

(9)

Here we have given l , d , and s , to find n , and since $l = 14$, $d = 1$, and $s = 105$, we have

$$n = \frac{2l + d}{2d} + \sqrt{\left(\frac{2l + d}{2d}\right)^2 - \frac{2s}{d}} = \frac{2 \times 14 + 1}{2 \times 1} + \sqrt{\left(\frac{2 \times 14 + 1}{2 \times 1}\right)^2 - \frac{2 \times 105}{1}} = 14\frac{1}{2} + \sqrt{\left(\frac{29}{2}\right)^2 - 210} = 14\frac{1}{2} + \sqrt{\frac{841}{4} - 210} = 14\frac{1}{2} + \sqrt{\frac{841 - 840}{4}} = 14\frac{1}{2} + \sqrt{\frac{1}{4}} = 14\frac{1}{2} + \frac{1}{2} = 15.$$

(10)

Here we have given a , d , and s , to find l , and since $a = \frac{2}{3}$, $d = \frac{1}{3}$, and $s = 1180$, we have

$$l = -\frac{1}{2}d + \sqrt{2ds + \left(a - \frac{1}{2}d\right)^2} = -\frac{1}{2} \text{ of } \frac{2}{3} + \sqrt{2 \times \frac{2}{3} \times 1180 + \left(\frac{2}{3} - \frac{1}{2} \times \frac{2}{3}\right)^2} = -\frac{1}{3} + \sqrt{\frac{4720}{3} + \left(\frac{1}{3}\right)^2} = -\frac{1}{3} + \sqrt{\frac{4720}{3} + \frac{1}{9}} = -\frac{1}{3} + \sqrt{\frac{14161}{9}} = -\frac{1}{3} + \frac{119}{3} = \frac{118}{3} = 39\frac{2}{3}.$$

(11)

Here we have given a , l , and s , to find d , and since $a = 8$, $l = 170$, and $s = 4895$, we have

$$d = \frac{(l + a)(l - a)}{2s - l - a} = \frac{(170 + 8)(170 - 8)}{2 \times 4895 - 170 - 8} = \frac{178 \times 162}{9790 - 178} = \frac{28836}{9612} = 3.$$

(12)

Here we have given a , l , and d , to find n , and since $a = 5$, $l = 27\frac{1}{2}$, and $d = 2\frac{1}{2}$, we have

$$n = \frac{l - a}{d} + 1 = \frac{27\frac{1}{2} - 5}{2\frac{1}{2}} + 1 = \frac{22\frac{1}{2}}{2\frac{1}{2}} + 1 = \frac{45}{5} + 1 = 10 + 1 = 11$$

(13)

Here we have given a , l , and n , to find s , and since $a = 2$, $l = 478$, and $n = 86$, we have

$$s = (a + l) \frac{n}{2} = (2 + 478) \frac{86}{2} = 480 \times 43 = 20640.$$

(14)

Here we have given a , l , and d , to find s , and since $a = 2$, $l = 998$, and $d = 6$, we have

$$s = \frac{(l+a)(l-a)}{2d} + \frac{l+a}{2} = \frac{(998+2)(998-2)}{2 \times 6} + \frac{998+2}{2} = \frac{1000 \times 996}{12} + \frac{1000}{2} = 83000 + 500 = 83500.$$

(15)

Here we have given a , n , and d , to find l , and since $a = 5$, $n = 11$, and $d = 2\frac{1}{2}$, we have

$$l = a + (n-1)d = 5 + (11-1)2\frac{1}{2} = 5 + 10 \times 2\frac{1}{2} = 5 + 4\frac{1}{2} \times 2 = 27\frac{1}{2}.$$

(16)

Here we have given l , d , and n , to find s , and since $l = 199$, $d = 11$, and $n = 19$, we have

$$s = \{2l - (n-1)d\} \frac{n}{2} = \{2 \times 199 - (19-1)11\} \frac{19}{2} = \{398 - 18 \times 11\} \frac{19}{2} = 200 \times \frac{19}{2} = 1900.$$

(17)

Here we have given s , a , and l , to find n , and since $s = 39840$, $a = 2$, and $l = 478$, we have

$$n = \frac{2s}{l+a} = \frac{2 \times 39840}{478+2} = \frac{79680}{480} = 166.$$

(18)

Here we have given s , l , and a , to find d , and since $s = 83500$, $l = 998$, and $a = 2$, we have

$$d = \frac{(l+a)(l-a)}{2s-l-a} = \frac{(998+2)(998-2)}{2 \times 83500 - 998 - 2} = \frac{1000 \times 996}{167000 - 1000} = \frac{996000}{166000} = 6.$$

(19)

Here we have given s , a , and d , to find n , and since $s = 260$, $a = 2$, and $d = 2$, we have

$$n = \frac{d-2a}{2d} + \sqrt{\frac{2s}{d} + \left(\frac{2a-d}{2d}\right)^2} = \frac{2-2 \times 2}{2 \times 2} + \sqrt{\frac{2 \times 260}{2} + \left(\frac{2 \times 2 - 2}{2 \times 2}\right)^2} = -\frac{1}{2} + \sqrt{260 + (-\frac{1}{2})^2} = -\frac{1}{2} + \sqrt{260\frac{1}{4}} = -\frac{1}{2} + 16.13226 = 15.63226 \text{ days} = 15 \text{ days, } 15 \text{ hours, } 10 \text{ minutes, } 27.264 \text{ seconds.}$$

(20)

Here we have given s , a , and d , to find l , and since $s = 83500$, $a = 2$, and $d = 6$, we have

$$l = -\frac{1}{2}d + \sqrt{2ds + (a - \frac{1}{2}d)^2} = -\frac{1}{2} \times 6 + \sqrt{2 \times 6 \times 83500 + (2 - \frac{1}{2} \times 6)^2} = -3 + \sqrt{1002000 + (2-3)^2} = -3 + \sqrt{1002001} = -3 + 1001 = 998.$$

(21)

Here we have given s , n , and l , to find a , and since $s = \$1125$, $n = 18$, and $l = 120$, we have

$$a = \frac{2s}{n} - l = \frac{2 \times 1125}{18} - 120 = 125 - 120 = 5.$$

(22)

Here we have given a , l , and n , to find d , and since $a = 5$, $l = 27\frac{1}{2}$, and $n = 11$, we have

$$d = \frac{l - a}{n - 1} = \frac{27\frac{1}{2} - 5}{11 - 1} = \frac{22\frac{1}{2}}{10} = 2\frac{1}{4}.$$

(23)

Here we have a , d , and n , given to find s , and since to deposit one stone he must walk 5 yards, and the distance travelled for each succeeding stone is 5 yards, therefore $a = 5$, $d = 5$, and $n = 220$.

$$\begin{aligned} \text{Then } s &= \{2a + (n - 1)d\} \frac{n}{2} = \{2 \times 5 + (220 - 1)5\} \frac{220}{2} \\ &= \{10 + 219 \times 5\} 110 = \\ 1105 \times 110 &= 121550 \text{ yards} = 69\frac{1}{16} \text{ miles.} \end{aligned}$$

(24)

Here we have s , n , and l , given to find a , and since $s = 39840$, $n = 166$, and $l = 478$, we have

$$a = \frac{2s}{n} - l = \frac{2 \times 39840}{166} - 478 = 480 - 478 = 2.$$

(25)

Here we have n , a , and d , given to find s , and since $n = 12$, $a = 4$, and $d = 2$, we have

$$s = \{2a + (n - 1)d\} \frac{n}{2} = \{2 \times 4 + (12 - 1)2\} \frac{12}{2} = \{8 + 11 \times 2\} 6 = 30 \times 6 = 180.$$

(26)

Here we have given a , l , and n , to find s , and $a = 1$, $l = 24$, and $n = 24$.

$$\text{Then } s = (a + l) \frac{n}{2} = (1 + 24) \frac{24}{2} = 25 \times 12 = 300.$$

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(5)

Here $n = 11$, $a = £1024$, and $r = 1\frac{1}{2}$.Then $l = ar^{n-1} = 1024 \times (\frac{3}{2})^{10} = 1024 \times \frac{59049}{1024} = £59049$.

$$s = \frac{rl - a}{r - 1} = \frac{\frac{3}{2} \times 59049 - 1024}{\frac{3}{2} - 1} = \frac{177147 - 1024}{\frac{1}{2}} = \frac{176099}{\frac{1}{2}} = £176099 = \text{whole fortune.}$$

(6)

Here $a = 7$, $l = 1240029$ and $s = 1860040$.

$$\text{Then } r = \frac{s - a}{s - l} = \frac{1860040 - 7}{1860040 - 1240029} = \frac{1860033}{620011} = 3.$$

(7)

Here $n = 12$, $a = £1$, and $l = £2048$.

$$\text{Then } r = \left(\frac{l}{a}\right)^{\frac{1}{n-1}} = \left(\frac{2048}{1}\right)^{\frac{1}{11}} = \sqrt[11]{2048} = 2.$$

$$s = \frac{rl - a}{r - 1} = \frac{2 \times 2048 - 1}{2 - 1} = 4096 - 1 = £4095.$$

(8)

Here $r = \frac{3}{2}$, $n = 8$, and $l = 106\frac{193}{112}$.

$$\text{Then } s = \frac{l(r^n - 1)}{(r - 1)r^{n-1}} = \frac{106\frac{193}{112} \times [(\frac{3}{2})^8 - 1]}{(\frac{3}{2} - 1)(\frac{3}{2})^7} = \frac{\frac{54675}{112} \times \frac{6305}{256}}{\frac{1}{2} \times \frac{2187}{128}} = \frac{25 \times 6305}{512} = 307\frac{441}{112}.$$

(9)

Here $a = 1$, $n = 7$, and $r = 3$.

$$\text{Then } s = \frac{a(r^n - 1)}{r - 1} = \frac{1 \times (3^7 - 1)}{3 - 1} = \frac{2187 - 1}{2} = 1093.$$

$$14^2 = 196$$

$$\frac{175000}{1} = 175000$$

(10)

Here $a = 1$, $l = 10077696$, and $n = 10$.

$$\text{Then } s = \frac{l^{\frac{n}{n-1}} - a^{\frac{n}{n-1}}}{l^{\frac{1}{n-1}} - a^{\frac{1}{n-1}}} = \frac{(10077696)^{\frac{10}{9}} - 1^{\frac{10}{9}}}{(10077696)^{\frac{1}{9}} - 1^{\frac{1}{9}}} =$$

$$13 = 3.$$

$$\frac{\sqrt[9]{(10077696)^{10}} - 1}{\sqrt[9]{10077696} - 1} = \frac{\sqrt[9]{(216)^{10}} - 1}{\sqrt[9]{216} - 1} = \frac{6^{10} - 1}{6 - 1} = \frac{60466176 - 1}{5} = 12093235.$$

(11)

$$= 2.$$

Here $a = 6$, $l = 3072$, and $s = 6138$.

$$4095.$$

$$\text{Then } r = \frac{s - a}{s - l} = \frac{6138 - 6}{6138 - 3072} = \frac{6132}{3066} = 2.$$

(12)

Here $r = 2$, $n = 11$, and $s = 20470$.

$$\text{Then } l = \frac{(r^n - 1)s}{r^n - 1} = \frac{(2^{11} - 1) \times 20470}{2^{11} - 1} = \frac{20470 \times 1024}{1024} = 20470.$$

$$\frac{675 \times 8305}{12 \times 256} =$$

$$1 \times \frac{2187}{128} =$$

(13)

Here $a = 1s.$, $n = 12$, and $r = 2$.

$$\text{Then } s = \frac{a(r^n - 1)}{r - 1} = \frac{1 \times (2^{12} - 1)}{2 - 1} = \frac{4095}{1} = 4095s. \\ = £204 \text{ } 15s.$$

(14)

Here $a = 1$ farthing, $r = 2$, and $n = 32$.

$$\text{Then } s = \frac{a(r^n - 1)}{r - 1} = \frac{1 \times (2^{32} - 1)}{2 - 1} = 4294967295 \text{ far.} = \\ £4473924 \text{ } 5s. \text{ } 3\frac{1}{4}d.$$

(15)

Here $a = 4$, $l = 78732$, and $n = 10$.

$$\text{Then } r = \left(\frac{l}{a}\right)^{\frac{1}{n-1}} = \left(\frac{78732}{4}\right)^{\frac{1}{10-1}} = \sqrt[9]{19683} = 3.$$

(16)

Here $a = 5$, $r = 2$, and $n = 7$.

$$\text{Then } l = ar^{n-1} = 5 \times 2^{7-1} = 5 \times 2^6 = 5 \times 64 = 320.$$

(17)

Here $a = 5$, $l = 327680$, and $r = 4$.

$$\text{Then } s = \frac{rl - a}{r - 1} = \frac{(327680 \times 4) - 5}{4 - 1} = \frac{1310715}{3} = 436905.$$

(18)

Here $a = 1$, $r = 2$, and $n = 64$.

$$1095 = 4095n.$$

$$\text{Then } s = \frac{a(r^n - 1)}{r - 1} = \frac{1 \times (2^{64} - 1)}{2 - 1} = 18446744073709551615 \text{ gr.}$$

$$18446744073709551615 \div (7680 \times 64) = 37529996894754 \text{ bush.}$$

$$\$1.50 \times 37529996894754 = \$56294995342131.$$

(19)

$$67295 \text{ far.} =$$

Here $r = 3$, $n = 10$, and $s = 295240$.

$$\text{Then } l = \frac{(r-1)sr^{n-1}}{r^n - 1} = \frac{(3-1) \times 295240 \times 3^9}{3^{10} - 1} = \frac{2 \times 295240 \times 19683}{59048} = 196830.$$

(20)

$$883 = 3.$$

Here $a = 1$, $l = 2048$, and $n = 12$.

$$\text{Then } s = \frac{l^{\frac{n}{r-1}} - a^{\frac{n}{r-1}}}{l^{\frac{1}{r-1}} - a^{\frac{1}{r-1}}} = \frac{2048^{1\frac{1}{11}} - 1^{1\frac{1}{11}}}{2048^{1\frac{1}{11}} - 1^{1\frac{1}{11}}} =$$

$$4 = 320.$$

$$\frac{\sqrt[11]{(2048)^{12} - 1}}{\sqrt[11]{2048 - 1}} = \frac{2^{12} - 1}{2 - 1} = 2^{12} - 1 = 4095.$$

(21)

$$= 436905.$$

Here $a = 5$, $r = 4$, and $n = 9$.

$$\text{Then } l = ar^{n-1} = 5 \times 4^{9-1} = 5 \times 4^8 = 5 \times 65536 = 327680.$$

Page 344.

(24)

Here $a = \frac{2}{7}$, and $r = \frac{2}{7}$.

$$\text{Then } s = \frac{a}{1-r} = \frac{\frac{2}{7}}{1-\frac{2}{7}} = \frac{\frac{2}{7}}{\frac{5}{7}} = \frac{2}{5}.$$

(25)

Here $a = 4$, and $r = \frac{1}{4}$.

$$\text{Then } s = \frac{a}{1-r} = \frac{4}{1-\frac{1}{4}} = \frac{4}{\frac{3}{4}} = 8.$$

(26)

Here $a = \frac{79}{100}$, and $r = \frac{1}{100}$.

$$\text{Then } s = \frac{a}{1-r} = \frac{\frac{79}{100}}{1-\frac{1}{100}} = \frac{\frac{79}{100}}{\frac{99}{100}} = \frac{79}{99}.$$

(27)

Here $a = \frac{1234}{10000}$, and $r = \frac{1}{10000}$.

$$\text{Then } s = \frac{a}{1-r} = \frac{\frac{1234}{10000}}{1-\frac{1}{10000}} = \frac{\frac{1234}{10000}}{\frac{9999}{10000}} = \frac{1234}{9999}.$$

Since
is 11.1st t
= 20 -
and so
AndSince
is 6.1st te
4th = 2
41½ +
AndSince
is 10.

Then

1st ter
= 1024;
so on.
And t

Page 345.

(3)

Since there are 9 means and 2 extremes the number of terms is 11.

$$\text{Then } d = \frac{l-a}{n-1} = \frac{92-2}{11-1} = \frac{90}{10} = 9.$$

1st term = 2; 2nd = $2 + 9 = 11$; 3rd = $11 + 9 = 20$; 4th = $20 + 9 = 29$; 5th = $29 + 9 = 38$; 6th = $38 + 9 = 47$; and so on.

And series is 2, 11, 20, 29, 38, 47, 56, 65, 74, 83, 92.

(4)

Since there are 4 means and two extremes the number of terms is 6.

$$\text{Then } d = \frac{l-a}{n-1} = \frac{50-7}{6-1} = \frac{43}{5} = 8\frac{3}{5}.$$

1st term = 7; 2nd = $7 + 8\frac{3}{5} = 15\frac{3}{5}$; 3rd = $15\frac{3}{5} + 8\frac{3}{5} = 24\frac{1}{5}$; 4th = $24\frac{1}{5} + 8\frac{3}{5} = 32\frac{4}{5}$; 5th = $32\frac{4}{5} + 8\frac{3}{5} = 41\frac{2}{5}$; and 6th = $41\frac{2}{5} + 8\frac{3}{5} = 50$.

And series is 7, $15\frac{3}{5}$, $24\frac{1}{5}$, $32\frac{4}{5}$, $41\frac{2}{5}$, 50.

(5)

Since there are 8 means and two extremes the number of terms is 10.

$$\text{Then } r = \left(\frac{l}{a}\right)^{\frac{1}{n-1}} = \left(\frac{4096}{16}\right)^{\frac{1}{10-1}} = \left(\frac{256}{1}\right)^{\frac{1}{9}} = 2.$$

1st term = 4096; 2nd = $4096 \times \frac{1}{2} = 2048$; 3rd = $2048 \times \frac{1}{2} = 1024$; 4th = $1024 \times \frac{1}{2} = 512$; 5th = $512 \times \frac{1}{2} = 256$, and so on.

And the means are 2048, 1024, 512, 256, 128, 64, 32, and 16.

(6)

Since there are 7 means and two extremes the number of terms is 9.

$$\text{Then } r = \left(\frac{l}{a}\right)^{\frac{1}{n-1}} = \left(\frac{1679616}{14}\right)^{\frac{1}{8}} = (1679616)^{\frac{1}{8}} = 6.$$

1st term = 14; 2nd = $14 \times 6 = 84$; 3rd = $84 \times 6 = 504$;
4th = $504 \times 6 = 3024$; 5th = $3024 \times 6 = 18144$, and so on.

And the means are 84, 504, 3024, 18144, 108864, 653184, and 3919104.

Page 347.

(3)

Assume 4 to be the number of men.

Then $2 \times 4 = 8 =$ number of women.

And $8 \times 3 = 24 =$ number of children.

6d. $\times 4 = 24$ d. = amount received by the men.

4d. $\times 8 = 32$ d. = " " " women.

2d. $\times 24 = 48$ d. = " " " children.

Sum, = 104d., but it should, by question, = 78d.

$$\text{Then } 104 : 78 :: 4 : \frac{78 \times 4}{104} = 3 = \text{number of men.}$$

$3 \times 2 = 6 =$ number of women, and $6 \times 3 = 18 =$ number of child-
ren.

(4)

Assume £8 to be the price of the harness.

Then $\text{£}8 \times 2 = 16 =$ price of horse.

And $\text{£}8 + \text{£}16 = \text{£}24 \times 2 = 48 =$ " chaise.

Sum, = £72, but it should by question = £60.

$$\text{Then } \text{£}72 : \text{£}60 :: \text{£}8 : \frac{8 \times 60}{72} = \text{£}6 \ 13 \ 4 = \text{price of harness.}$$

$\text{£}6 \ 13 \ 4 \times 2 = 13 \ 6 \ 8 =$ " horse.
 $\text{£}6 \ 13 \ 4 + \text{£}13 \ 6 \ 8 = \text{£}20 \times 2 = 40 \ 0 \ 0 =$ " chaise.

(5)

Assume 20 as C's age.

Then $20 \times 3 = 60 = B$'s age.And $60 \times 2 = 120 = A$'s age.

Sum = 200, but by question it should = 140.

Then $200 : 140 :: 20 : \frac{20 \times 140}{200} = 14 = C$'s age. $14 \times 3 = 42 = B$'s age, and $42 \times 2 = 84 = A$'s age.

(6)

Assume 100.

One fourth of 100 = 25 and remainder = $100 - 25 = 75$.One fifth of 75 = 15 and remainder = $75 - 15 = 60$, but it should by the question = 72.Then $60 : 72 :: 100 : \frac{100 \times 72}{60} = 120$.

(7)*

A can do the work in 7 days \therefore he will do $\frac{1}{7}$ of it in 1 day.B " " 5 " \therefore " $\frac{1}{5}$ " "C " " 6 " \therefore " $\frac{1}{6}$ " "Then all working together will do $\frac{1}{7} + \frac{1}{5} + \frac{1}{6} = \frac{19}{105}$ in 1 day.Therefore to do the whole work it will take them $\frac{1}{\frac{19}{105}} = \frac{105}{19} = 11\frac{16}{19}$ days.

(8)*

A and B working together can do it in 10 days \therefore they will do $\frac{1}{10}$ of it in 1 day.A can do it in 15 days \therefore he will do $\frac{1}{15}$ of it in 1 day.Therefore $\frac{1}{10} - \frac{1}{15} = \frac{1}{30} =$ amount done by B in 1 day.Then if he does $\frac{1}{30}$ in 1 day, it will take him 30 days to do the whole.

* * The mode of working these questions by position is so simple that they cannot trouble any one; it has therefore been thought advisable to work them by simple analysis.

(9)*

The first pipe empties the whole of it in 1 hour.

The second pipe empties $\frac{1}{2}$ of it in 1 hour.

The third pipe empties $\frac{1}{3}$ of it in 1 hour.

Then all these pipes running together will empty $1 + \frac{1}{2} + \frac{1}{3}$
 $= \frac{11}{6}$ in 1 hour.

Therefore to empty the cistern it will take $1 \div \frac{11}{6} = \frac{6}{11}$ hours.

(10)

Assume 84

One third of 84 = 28

One sixth of 84 = 14

One seventh of 84 = 12

Sum = 54, but by question it should = 27.

$$\text{Then } 54 : 27 :: 84 : \frac{84 \times 27}{54} = 42.$$

(11)*

All 5 mills working together will grind $7 + 5 + 4 + 3 + 1$
 $= 20$ bushels in 1 hour.

Therefore to grind 500 bushels it will take them $500 \div 20 =$
 25 hours.

Therefor

(12)*

One pipe fills $\frac{1}{4}$ of the cistern in 1 hour, and the other
 empties $\frac{1}{8}$ of it in 1 hour.

Then $\frac{1}{4} - \frac{1}{8} = \frac{1}{8}$ = part of the cistern filled in 1 hour
 when both are left open.

And if $\frac{1}{8}$ of it is filled in 1 hour, the whole will be filled in

$$\frac{1}{\frac{1}{8}} = 8 \text{ hours.}$$

* See note on page 227.

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(6)

Assume 60 for father's age, then 15 = son's.

$$\begin{array}{r} 5 \\ \hline 5)55 \\ \hline 11 \\ 10 \\ \hline -1 \end{array}$$

Assume 100 for father's age, then 25 = son's.

$$\begin{array}{r} 5 \\ \hline 5)95 \\ \hline 19 \\ 20 \\ \hline +1 \end{array}$$

Errors. Assumed numbers.

$$\begin{array}{rcl} -1 & \times & 100 = 100 \\ +1 & \times & 60 = 60 \end{array}$$

Sum of errors = 2 Sum of products = 160

Therefore result required = $160 \div 2 = 80$ = father's age, and
 $\frac{1}{2}$ of 80 = 20 = son's age.

(7)

Assume 80

Assume 44

$$\begin{array}{r} 34 \\ \hline 46 \\ 3 \\ \hline 138 \\ 80 \\ \hline 58 \end{array}$$

$$\begin{array}{r} 34 \\ \hline 10 \\ 3 \\ \hline 30 \\ 44 \end{array}$$

$$\frac{1}{2} \text{ of } 80 = 20$$

$$\frac{1}{2} \text{ of } 44 = 11$$

$$+ 38$$

$$\begin{array}{r} -14 \\ \hline -25 \end{array}$$

(Continued on next page.)

(7 continued.)

Errors. Assumed numbers.

$$\begin{array}{rclcl} -25 & \times & 80 & = & 2000 \\ +38 & \times & 44 & = & 1672 \end{array}$$

$$\text{Sum of errors} = 63 \qquad \qquad \qquad 3672$$

$$\text{Therefore result required} = 3672 \div 63 = 58\frac{2}{3}.$$

(9)

Assume 18 and 7

$$\text{One half of } 18 = 9 \quad 2 \times 7 = 14$$

14

— 5

Assume 22 and 3

$$\text{One half of } 22 = 11 \quad 2 \times 3 = 6$$

6

+ 5

Errors. Assumed numbers.

$$\begin{array}{rclcl} -5 & \times & 22 & = & 110 \\ +5 & \times & 18 & = & 90 \end{array}$$

$$\text{Sum of errors} = 10 \quad \text{Sum of products} = 200$$

$$\text{Then } 200 \div 10 = 20 = \text{one number, and } 25 - 20 = 5 \\ = \text{other number.}$$

(10)

A.	B.	A.	B.
Suppose 8	6	Suppose 6	6
22½	9	22½	9
—	12	—	12
180	15	135	15
132	18	81	18
—	21	—	21
3)48	24	6)54	—
—	27	—	81
+ 6	—	+ 9	—
6	132	8	—
—	—	—	—
36	—	72	—
72	—	—	—
—	—	—	—
3)36	—	—	—
—	—	—	—
12	—	—	—

$$9 - 6 = 3 = \text{difference of errors.}$$

4th
√16NOTE.—
numbers aexample 1:
It may,Suppose A
Then 9 +
6
6 + 1 =Suppose A
Then 11 +
first.
7 + 1 = 8.

(12)

Assume 30.

$$\begin{aligned} \frac{1}{2} \text{ of } 30 &= 15; \frac{1}{3} \text{ of } 30 = 7\frac{1}{2}; \\ \frac{1}{4} \text{ of } 30 &= 6; \text{ and } \frac{1}{5} \text{ of } 30 = 5; \\ 15 \times 7\frac{1}{2} \times 6 \times 5 &= 3375; \\ 3375 - 6998\frac{1}{2} &= -3623\cdot4 = \text{error.} \end{aligned}$$

Assume 60.

$$\begin{aligned} \frac{1}{2} \text{ of } 60 &= 30; \frac{1}{3} \text{ of } 60 = 15; \\ \frac{1}{4} \text{ of } 60 &= 12; \text{ and } \frac{1}{5} \text{ of } 60 = 10. \\ 30 \times 15 \times 12 \times 10 &= 54000. \\ 54000 - 6998\frac{1}{2} &= +47001\cdot6 = \text{error.} \\ 30^4 &= 810000, \text{ and } 60^4 = 12960000 \\ -3623\cdot4 \times 12960000 &= 46959264000 \\ +47001\cdot6 \times 810000 &= 38071296000 \end{aligned}$$

Sum = 50625

Sum = 85030560000

$$85030560000 \div 50625 = 1679616$$

4th root = square root of square root.

$$\sqrt{1679616} = 1296, \text{ and } \sqrt{1296} = 36 = \text{required number.}$$

NOTE.—For reason why we multiply by the 4th powers of the assumed numbers and then take the 4th root of the quotient, see Arith. page 352.

Let x = the number required.

example 11.

It may, however, perhaps be clearer from the following illustration :

$$\begin{aligned} \text{Then } \frac{x}{2} \times \frac{x}{4} \times \frac{x}{5} \times \frac{x}{6} &= \frac{x^4}{240} = 6998\frac{1}{2} \\ \therefore x^4 &= 1679616 \\ \therefore x &= \sqrt[4]{1679616} = 36. \end{aligned}$$

(13)

Suppose A had 9s. at first.

Then $9 + 1 = 10$; $10 \div 2 = 5$; $5 + 1 = 6$ = what B had at first. $6 + 1 = 7$, but should = $9 - 1 = 8$.

$$\text{Error} = 7 - 8 = -1.$$

Suppose A had 11s. at first.

Then $11 + 1 = 12$; $12 \div 2 = 6$; $6 + 1 = 7$ = what B had at first. $7 + 1 = 8$, but should = $11 - 1 = 10$.

$$\text{Error} = 8 - 10 = -2.$$

(Continued on next page.)

(13 continued.)

Errors.

$$- 2 \times 9 = 18$$

$$- 1 \times 11 = 11$$

$$\text{Diff.} = 1 \quad \text{diff.} = 7$$

 $7 \div 1 = 7 = \text{shillings A had at first.}$
 $7 + 1 = 8; 8 \div 2 = 4; 4 + 1 = 5 = \text{shillings B had at first.}$

(14)

Assume 24 and 6.

Assume 20 and 10.

$$2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2} = 24.$$

$$2\frac{1}{2} + 2\frac{1}{2} + 2\frac{1}{2} = 20.$$

$$\frac{1}{2} + \frac{1}{2} \text{ of } 6 + \frac{1}{2} = 9.$$

$$\frac{1}{2} + \frac{1}{2} \text{ of } 10 + \frac{1}{2} = 15.$$

$$24 - 9 = + 15 = \text{error.}$$

$$20 - 15 = + 5 = \text{error.}$$

Errors.

$$+ 15 \times 20 = 300$$

$$+ 5 \times 24 = 120$$

$$\text{Diff.} = 10 \quad \text{diff.} = 180$$

$$180 \div 10 = 18 = \text{one number.}$$

$$30 - 18 = 12 = \text{other number.}$$

(15)

Suppose 1st horse to be worth £20.

$$20 + 50 = 70; 70 \div 2 = £35 = \text{value of 2nd horse.}$$

$$35 + 50 = 85, \text{ but it should equal } 60, \text{ i. e. } (20 \times 3).$$

$$\text{Then } 60 - 85 = - 25 = \text{error.}$$

Suppose 1st horse to be worth £60.

$$£60 + £50 = £110; £110 \div 2 = £55 = \text{worth of 2nd horse.}$$

$$55 + 50 = 105, \text{ but it should equal } 180, \text{ i. e. } (60 \times 3).$$

$$180 - 105 = + 75 = \text{error.}$$

Errors.

$$75 \times 20 = 1500$$

$$25 \times 60 = 1500$$

$$\text{Sum} = 100$$

$$\text{Sum} = 3000$$

$$3000 \div 100 = £30 = \text{value of 1st horse.}$$

$$£30 + £50 = £80; £80 \div 2 = £40 = \text{value of 2nd horse.}$$

Sup

11 ×

11 ×

Sup

12 ×

12 ×

E

Diff

Here P

Then A

= 2

Hen

Here n =

Then t =

130-69

Here A =

Then t =

(16)

Suppose there were 11 beggars.

$$11 \times 4 = 44; 44 + 6 = 50 = \text{number of pence he had.}$$

$$11 \times 6 = 66; 66 - 12 = 54 = \quad \quad \quad "$$

$$54 - 50 = + 4 = \text{error.}$$

Suppose there were 12 beggars.

$$12 \times 4 = 48; 48 + 6 = 54 = \text{pence he had.}$$

$$12 \times 6 = 72; 72 \div 12 = 60 = \text{pence he had.}$$

$$60 - 54 = + 6 = \text{error.}$$

Errors.

$$11 \times 6 + 6 \times 11 = 66$$

$$12 \times 6 + 4 \times 12 = 48$$

$$\text{Diff.} = 2 \quad \text{diff.} = 18, \text{ and } 18 \div 2 = 9 = \text{number of beggars.}$$

Page 357.

(7)

Here $P = \$713.29$, $r = .045$, and $t = 14$.Then $A = P(1+r)^t$, or $\log. A = \log. P + \log. (1+r) \times t$

$$= 2.853267 + .019118 \times 14 = 3.120891 = \log. \text{ of } Ans.$$

Hence amount = \$1320.96.

(8)

Here $n = 7$, $r = .015$.

$$\text{Then } t = \frac{\log. n.}{\log. (1+r)} = \frac{845098}{.006466} = 130.698 \text{ payments, and}$$

$$130.698 \div 4 = 32.674 \text{ years} = 32 \text{ years 8 months 2 days.}$$

(9)

Here $A = \$1111.11$, $P = 111.11$, and $r = .08$.

$$\text{Then } t = \frac{\log. A - \log. P}{\log. (1+r)} = \frac{3.045757 - 2.045753}{.033424} = \frac{1.000004}{.033424}$$

$$= 29.918 \text{ years} = 29 \text{ years 11 months.}$$

(10)

Here $A = \$3333.33$, $P = \$222.22$, and $t = 120$.

$$\text{Then } r = \frac{tA}{P} - 1; \text{ or } \log. (1+r) = \frac{\log. A - \log. P}{t} =$$

$$\frac{3.522878 - 2.346784}{120} = \frac{1.176095}{120} = .0098007. \text{ Hence } 1+r$$

$$= 1.0228, r = .0228, \text{ and rate per cent.} = 2\frac{7}{8}.$$

(11)

Here $n = 2$ and $r = .07$.

$$\text{Then } t = \frac{\log. n}{\log. (1+r)} = \frac{0.301030}{0.029384} = 10.2446 \text{ years} = 10 \text{ yrs.}$$

2 months 28 days.

(12)

Here $A = \$100$, $r = .0225$, and $t = 28$.

$$\text{Then } P = \frac{A}{(1+r)^t}, \text{ or } \log. P = \log. A - \log. (1+r) \times t.$$

$$\log. P = 2 - 0.009664 \times 28 = 2 - 0.270592 = 1.729408.$$

$$\text{Hence } P = \$53.63.$$

(13)

Here $P = \$2468.13$, $r = .0375$, and $t = 26$.

$$\text{Then } A = P(1+r)^t, \text{ or } \log. A = \log. P + \log. (1+r) \times t.$$

$$\log. A = 3.392368 + 0.015988 \times 26 = 3.392368 + 0.415688$$

$$= 3.808056.$$

$$\text{Hence } A = \$6427.705.$$

(14)

Here $A = \$7137.40$, $r = .0425$, and $t = 22$.

$$\text{Then } P = \frac{A}{(1+r)^t}, \text{ or } \log. P = \log. A - \log. (1+r) \times t.$$

$$\log. P = 3.853540 - 0.018076 \times 22 = 3.853540 - 0.397672$$

$$= 3.455868.$$

$$\text{Hence } P = \$2856.723,$$

(15)

Here $n = 19$, and $r = .0525$.

$$\text{Then } t = \frac{\log. n}{\log. (1 + r)} = \frac{1.278754}{0.022222} = 57.5445 \text{ payments} =$$

28.7225 years = 28 years 9 months 8 days.

Page 330.

(3)

Here $r = .03$, $a = 500$, $A = 8365$.

$$\begin{aligned} \text{Formula IV. } t &= \frac{\sqrt{\left\{ \frac{8rA}{a} + (2-r)^2 \right\}} - (2-r)}{2r} \\ &= \frac{\sqrt{\left\{ \frac{8 \times .03 \times 8365 + (2 - .03)^2 \right\}}{500}} - (2 - .03)}{2 \times .03} \\ &= \frac{\sqrt{\left\{ \frac{2007.6}{500} + 3.8809 \right\}} - 1.97}{.06} \end{aligned}$$

$$\begin{aligned} &= \frac{\sqrt{(4.0152 + 3.8809) - 1.97}}{.06} = \frac{\sqrt{7.8961 - 1.97}}{.06} \\ &= \frac{2.81 - 1.197}{.06} = \frac{.84}{.06} = \frac{84}{6} = 14 \text{ payments} = 7 \text{ years.} \end{aligned}$$

(4)

Here $a = 112.50$, $r = .015$, $t = 44$.

$$\begin{aligned} \text{Formula I. } A &= at \left(1 + \frac{(t-1)r}{2} \right) \\ &= 112.50 \times 44 \left(1 + \frac{(44-1) \times .015}{2} \right) = 4950 \times 1.3225 \\ &= \$6546.375. \end{aligned}$$

(5)

Here $a = 300$, $A = 1680$, and $t = 5$.

$$\begin{aligned} \text{Formula III. } r &= \frac{2(A - at)}{at(t-1)} = \frac{2(1680 - 300 \times 5)}{300 \times 5(5-1)} \\ &= \frac{2(1680 - 1500)}{300 \times 5 \times 4} = \frac{2 \times 180}{6000} = \frac{360}{6000} = .06. \end{aligned}$$

$$\therefore \text{Rate per cent} = .06 \times 100 = 6.$$

(6)

Here $A = 2080$, $r = .04$, and $t = 16$.

$$\begin{aligned} \text{Formula II. } a &= \frac{2A}{t\{2 + (t-1)r\}} = \frac{2 \times 2080}{16\{2 + (16-1) \cdot 04\}} \\ &= \frac{4160}{16 \times (2 + 15 \times .04)} = \frac{4160}{16 \times 2.6} = \frac{4160}{41.6} = \frac{4160}{416} \end{aligned}$$

$$= \$100 = 1 \text{ payment or rent for half a year, hence yearly rent} = \$100 \times 2 = \$200.$$

Page 366.

(5)

Here $r = .04$, and $v = \$3000$.

$$\text{Then } a = vr = 3000 \times .04 = \$120.$$

(6)

Here $a = 563$, and $v = 11260$

$$\begin{aligned} \text{Then } r &= \frac{a}{v} = \frac{563}{11260} = \frac{1}{20} = .05, \text{ and hence rate} \\ &\text{per cent.} = 5. \end{aligned}$$

(7)

Here $a = 75$, $r = .05$, and $s = 14$.

$$\text{Then } v = \frac{a}{r(1+r)^s} = \frac{75}{.05 \times (1.05)^{14}}$$

$$\log. v = \log. 75 - \log. (1.05) \times 14$$

$$= 1.875061 - (0.021189 \times 14 + \log. .05)$$

$$= 1.875061 - (0.296646 + 2.698970).$$

$$= 2.879445.$$

$\therefore v = \text{nat. number corresponding to the logarithm } 2.879445,$
which is \$757.608.

(8)

Here $a = \$90$, $r = .04$, $t = 12$, $s = 7$, and $\therefore s + t = 19$.

$$\begin{aligned} \text{Formula VII. } v &= \frac{a}{r} \left\{ \frac{1}{(1+r)^t} - \frac{1}{(1+r)^{s+t}} \right\} \\ &= \frac{90}{.04} \left\{ \frac{1}{(1.04)^{12}} - \frac{1}{(1.04)^{19}} \right\} = \frac{9000}{4} \left\{ \frac{1}{1.60101} - \frac{1}{2.10682} \right\} \\ &= 2250 \times (.624605 - .474649) = 2250 \times .149956 \\ &= \$337.3988. \end{aligned}$$

(9)

Here $a = 1500$, and $r = .05$.

$$\begin{aligned} \text{Formula VIII. } v &= \frac{a}{r} = \frac{1500}{.05} = \frac{150000}{5} = \$30000 \\ &= 20 \times 1500 \text{ or } 20 \text{ years' purchase.} \end{aligned}$$

(10)

Here $a = 22$, $v = 308.64366$, and $r = .04$.

$$\text{Then Formula VI. } t = \frac{\log. a - \log. (a - vr)}{\log. (1 + r)}$$

$$= \frac{\log. 22 - \log. (22 - 308.6436 \times .04)}{\log. (1.04)}$$

$$= \frac{1.342423 - \log. (9.65425)}{\log. (1.04)} = \frac{1.342423 - 0.984707}{0.017033}$$

$$= \frac{0.357716}{0.017033} = 21 +.$$

$$= \frac{357716}{1117033} = 21 +.$$

100 × 5)

5 - 1)

.06.

.

× 2080

16 - 1) .04}

41600

416

hence yearly

hence rate

(11)
Here $a = 154$, $t = 19$, and $r = .05$.

$$\begin{aligned} \text{Formula IV. } s &= \frac{a}{r} \left\{ 1 - \frac{1}{(1+r)^t} \right\} \\ &= \frac{154}{.05} \times \left\{ 1 - \frac{1}{(1.05)^{19}} \right\} = \frac{15400}{5} \times \left\{ 1 - \frac{1}{2.5269} \right\} \\ &= 3080 \times (1 - .39574) = 3080 \times .60426 = \$1861.12 + \end{aligned}$$

(12)
Here $A = 600$, $t = 40$, and $r = .0375$.

$$\begin{aligned} \text{Formula II. } a &= \frac{Ar}{(1+r)^t - 1} = \frac{600 \times .0375}{(1.0375)^{40} - 1} \\ &= \frac{22.5}{22.5} = \frac{2250000}{4.36034 - 1} = \frac{2250000}{3.36034} \\ &= £66957 = £6 \text{ } 13s. \text{ } 10\frac{1}{2}d +. \end{aligned}$$

(13)
Here $a = 8$, $A = 187.315625$ and $r = .03$.

$$\begin{aligned} \text{Formula III. } t &= \frac{\log (Ar + a) - \log a}{\log (1+r)} \\ &= \frac{\log (187.315625 \times .03 + 8) - \log 8}{\log 1.03} \\ &= \frac{\log (5.61946875 + 8) - \log 8}{\log 1.03} \\ &= \frac{\log 13.61946875 - \log 8}{\log 1.03} = \frac{1.134160 - 0.903090}{0.012837} \\ &= \frac{0.231070}{0.012837} = \frac{231070}{12837} = 18. \end{aligned}$$

(14)
Here $A = 74$, $r = .04$ and $t = 30$

$$\begin{aligned} \text{Formula I. } A &= a \left\{ \frac{(1+r)^t - 1}{r} \right\} \\ &= \frac{74}{.04} \times (3.24332 - 1) = \frac{7400}{4} \times 2.24332 = \$4150.142 \end{aligned}$$

By Table, page 362. Amount of \$1 for 30 years, at 4 per cent.
= \$58.08494

Then $\$58.08494 \times 74 = \4150.28 ,

Page 267.

EXAMINATION PAPERS.

FIRST SERIES.

(2)

$$\$7580 \times .19 = \$1440.20, \text{ and } \$7580 - \$1440.20 = \$6139.80.$$

D is to have one third as much as A, B, and C together, therefore he will have one-fourth of the whole. $\frac{1}{4}$ of $\$6139.80 = \$1534.95 = D's \text{ share.}$

$$\$6139.80 - \$1534.95 = \$4604.85 = \text{amount to be divided among A, B, and C.}$$

B is to have $\$90.90$ more than C.

$$A \text{ is to have } \$111.11 + \$90.90 = 202.01 \quad " \quad " \quad "$$

$$\underline{\$292.91}$$

$$\$4604.85 - \$292.91 = \$4311.94 = \text{three times C's share.}$$

$$\$4311.94 \div 3 = \$1437.31\frac{1}{3} = C's \text{ share.}$$

$$\$1437.31\frac{1}{3} + \$90.90 = \$1528.21\frac{1}{3} = B's \text{ share.}$$

$$\$1528.21\frac{1}{3} + \$111.11 = \$1639.32\frac{1}{3} = A's \text{ share.}$$

(3)

A and B working together can do the work in 96 hours, therefore in one hour they will do $\frac{1}{96}$ of it.

A by himself can do the work in 192 hours; therefore in 1 hour he can do $\frac{1}{192}$ of it. $\frac{1}{96} - \frac{1}{192} = \frac{1}{192} = \text{part B can do in one hour.}$ Therefore he will require as many hours to finish it as $\frac{1}{192}$ is contained times in the whole, i. e. $1 \div \frac{1}{192} = 192 \text{ hours.}$ Then $192 \div 14 = 13\frac{4}{7} \text{ days.}$

(4)

$$£179 \text{ 14s. 8\frac{1}{2}d.} = \$718.94\frac{7}{8} = \$718.94583.$$

$$\$718.94583 \div .00000048 = \$7189458333.3 \div 48 =$$

$$\$1497803819.4444.$$

(5)

$$\begin{array}{r|l} 77 & 44..18..30..77..58..27 \\ 30 & 4..18..30 \quad \quad \quad 8..27 \\ 36 & 2..8 \quad \quad \quad 4..8 \end{array}$$

$$77 \times 30 \times 36 = 83160 = 1, \text{ c. m.}$$

(6)

Here $n = 20$, and $r = .0525$.

$$\text{Then } t = \frac{n-1}{r} = \frac{20-1}{.0525} = \frac{19}{.0525} = 361.9028 \text{ years} =$$

361 years 10 months 25 days.

(7)

7342163 octenary = 770e57 duodenary, and 61351 nonary = 1e454 duodenary.

$$770e57 \div 1e454 = 40.38 \text{ duodenary.}$$

(8)

$$783\frac{1}{2} = 3\frac{1}{2} + 10 \times 8 + 10 \times 10 \times 7.$$

lbs.	oz.	dwt.	grs.		lbs.	oz.	dwt.	grs.
43	3	17	11	$\times 3\frac{1}{2}$	=	151	7	11
			10					2

433	2	14	14	$\times 8$	=	3465	9	16	16
			10						

4332	3	5	20	$\times 7$	=	30325	11	0	20
						33943	4	8	14

(9)

Here $a = 1$, and $r = \frac{1}{2}$.

$$\text{Then } S = \frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = \frac{1}{\frac{1}{2}} = 2.$$

(10)

$$\frac{1}{2} \text{ of } \frac{1}{2} \text{ of } 192 \div \frac{2\frac{1}{2}}{3} = 64 \div \frac{\frac{5}{2}}{3} = 64 \div \frac{\frac{5}{2}}{\frac{3}{2}} = 64 \div \frac{5}{3} = 64 \div \frac{5}{3} = 64 \times \frac{3}{5} = 129\frac{1}{5}.$$

(11)

Logarithm of 129140163 = 8.111061.

 $8.111061 \div 17 = .477121 = \text{logarithm of } 3.$

(12)

Suppose 48

$$\begin{array}{r} 18 \\ \hline 66 \\ 84 \\ \hline -18 \end{array}$$

Suppose 36

$$\begin{array}{r} 18 \\ \hline 54 \\ 63 \\ \hline -9 \end{array}$$

Errors. Assumed numbers.

$$-18 \times 36 = 648$$

$$-9 \times 48 = 432$$

Difference of errors = 9

9)216 = sum of products.

24

SECOND SERIES.

(13)

B is to have \$69.18 more than C.

A is to have \$69.18 + \$93.40 = \$162.58 " " "

\$231.76

 $\$897.43 - \$231.76 = \$665.67 = \text{Amount to be divided equally amongst A, B, and C.}$ $\$665.67 \div 3 = \$221.89 = \text{C's share.}$ $\$221.89 + \$69.18 = \$291.07 = \text{B's "}$ $\$291.07 + \$93.40 = \$384.47 = \text{A's "}$

(14)

7 lbs. wheat	= 9 lbs. rye	}	y = 9
5 " rye	= 8 " oats		5 = 8
13 " oats	= 21 " buckwheat		13 = 21 7
27 " buckwheat	= 20 " barley		3 27 = 20 4
24 " barley	= 26 " peas		3 24 = 26 2
11 " peas	= 35 " potatoes		11 = 35
x " potatoes	= 16 " wheat		x = 16

$$\begin{array}{r} 4 \times 2 \times 35 \times 16 = 4480 \\ \text{Ans. } \frac{\quad}{3 \times 11} = \frac{4480}{33} = 135\frac{20}{33} \end{array}$$

028 years =

51 nonary =

wt. grs.

11 2½

16 16

0 20

8 14½

$$64 \div \frac{8}{16}$$

(15)

$\frac{1}{2}$ of $4\frac{1}{2}$ of $7\frac{1}{2}$ of $\frac{9}{19\frac{1}{2}}$ of $\frac{1}{2}$ of 3 oz. 4 drs. 2 scr. 5 grs. = $\frac{1}{2}$ of $\frac{1}{2}$ of

$\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{2}$ of 1725 grs. = 10350 grs.

$\frac{1}{11}$ of .63 of $2\frac{1}{2}$ of $\frac{1}{11}$ of $6\frac{1}{2}$ times 7 lbs. 3 oz. = $\frac{1}{11}$ of $\frac{1}{11}$ of $\frac{1}{11}$ of $\frac{1}{11}$ of $\frac{1}{11}$ of 41760 grs. = 62640 grs.

$$10350 \div 62640 = .165229.$$

(16)

Dissimilar.

Similar.

Similar and Coterminous.

$$623 \cdot 42793 = 623 \cdot 42793793 = 623 \cdot 42793793793$$

$$93 \cdot 4267192 = 93 \cdot 4267192 = 93 \cdot 42671929292$$

$$\text{Difference} = 530 \cdot 00121864500$$

(17)

$$\$1.00 - \$0.046 = \$0.954, \text{ and } \$7493 \div 0.954 = \$7854.29.$$

(18)

36 : 20 weeks
6 : 5 days
9 : 11 hours
11 : 24 cellars
20 : 22 feet long
16 : 22 feet wide
5 : 4 feet deep

$$\begin{array}{r} \frac{11 \times 22}{9} \\ \therefore 18 \text{ men: } \frac{18 \times 20 \times 5 \times 11 \times 24 \times 22 \times 4}{88 \times 5 \times 9 \times 11 \times 20 \times 16 \times 5} \end{array}$$

$$= \frac{11 \times 22}{9} = 26\frac{2}{3}.$$

(19)

$\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{1}{4}$ = $\frac{1}{12}$; and if $\frac{1}{12}$ of a certain number = $\frac{1}{12}$, $\frac{1}{12}$ = $\frac{1}{12}$,
and $\frac{1}{12}$ = $\frac{1}{12} \times 35 = 12$.

$$\left(\left\{ \left[\left[(12 \times 12) + 81 \right] \times 3 \right] - 33 \right\} \times 300 \right) \div 17 \times 9 = 81000.$$

(20)

$$\begin{array}{r} 1176 \mid 480..480..848..1176 \\ 32 \mid 20..32..20 \\ 145 \mid 5 \quad 20 \\ 1176 \times 32 \times 145 = 5458640. \end{array}$$

rs. = $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{11}$ of $\frac{1}{11}$ of $\frac{1}{11}$

Coterminous.

793793793

671929292

121864500

= \$7854.29.

11

 $\times 22 \times 22 \times 4$ $\times 14 \times 5$

4

2

 $\frac{1}{11}, \frac{1}{11} = \frac{1}{11}$ $17 \frac{1}{2} \times 9$

(21)

838)171347(204

1676

3747

3952

17598)48090(2

35196

10894)17598(1

10894

6704)10894

6704

4190)8704(1

4190

2514)4190(1

2514

1676)2514(1

1676

838)1676(2

1676

395)838(2

790

48)395(8

384

11)48(4

44

4)11(2

8

3)4(1

8

1)3

3

As no number greater than unity will divide all of them without a remainder, they have no G. O. M.

(22)

 $\$12000 \times 4 = \48000 $\$12000 + \$8000 = \$20000 \times 2 = \40000

$\$80000$ = product of A's
stock and time.

 $\$25000 \times 3 = \75000 $\$25000 - \$10000 = \$15000 \times 3 = \45000

$\$120000$ = product of B's
stock and time.

 $\$35000 \times 2 = \70000

(Continued on next page.)

(22 continued.)

$$\frac{1}{4} \text{ of } \$35000 = \$10000. \quad \$35000 - \$10000 = \$25000 \times 4 = \$100000$$

$$\underline{\$170000}$$

= product of O's stock and time.

$$\$38000 + \$120000 + \$170000 = \$378000 = \text{sum of the products of stocks and times.}$$

$$\text{Then } \$378000 : \$88000 :: \$15000 : \frac{15000 \times 88000}{378000} = \$3492.06$$

$$= \text{A's share.}$$

$$\$378000 : \$170000 :: \$15000 : \frac{15000 \times 170000}{378000} = \$6746.03$$

$$= \text{O's share.}$$

$$\$15000 - (\$3492.06 + \$6746.03) = \$4761.91 = \text{B's share.}$$

(23)

$$\text{A's gain in 5 months} = \$125 \therefore \text{his gain for 9 months}$$

$$= 1\frac{1}{5} \times \$125 = \$225$$

$$\text{B's gain in 6 months} = \$125 \therefore \text{his gain for 9 months}$$

$$= 1\frac{1}{2} \times \$125 = \$187\frac{1}{2}$$

$$\text{C's gain in 9 months} = \$125$$

$$\text{Sum} = \$537\frac{1}{2}$$

$$\text{Then } \$537\frac{1}{2} : \$225 :: \$400 : \frac{400 \times 225}{537\frac{1}{2}} = \$167\frac{1}{3} = \text{A's stock.}$$

$$\$537\frac{1}{2} : \$187\frac{1}{2} :: \$400 : \frac{400 \times 187\frac{1}{2}}{537\frac{1}{2}} = \$139\frac{1}{3} = \text{B's stock.}$$

$$\$537\frac{1}{2} : \$125 :: \$400 : \frac{400 \times 125}{537\frac{1}{2}} = \$93\frac{1}{3} = \text{C's stock.}$$

(24)

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{16} + \frac{1}{12} = \frac{17}{48} = \frac{17}{48} = \text{part of the cistern filled in one hour when the four pipes are left open.}$$

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{16} + \frac{1}{12} = \frac{17}{48} = \frac{28}{48} = \text{part of the cistern emptied in one hour when the four are left open.}$$

$$\frac{17}{48} - \frac{28}{48} = \frac{11}{48} = \frac{11}{48} = \text{part of the cistern which remains filled after the eight pipes have been left open for one hour. And if } \frac{11}{48} \text{ of the cistern are emptied in one hour, it will take } 1 \div \frac{11}{48} = 2\frac{2}{11} \text{ hours to empty the whole of it.}$$

$$\times 4 = \$100000$$

$$\$170000$$

m of the pro-

$$= \$3492.06$$

$$= \$6746.03$$

= B's share.

months

$$.... = \$225$$

months

$$.... = \$187\frac{1}{2}$$

$$.... = \$125$$

$$\text{Sum} = \$537\frac{1}{2}$$

= A's stock.

= B's stock.

C's stock.

ern filled in

r emptied in

s filled after

our. And if

ill take 1 ÷

THIRD SERIES.

(26)

As often as the first receives 4 the second receives 3, therefore as often as the first receives 6 the second receives $4\frac{1}{2}$. Then $6 + 4\frac{1}{2} + 7 = 17\frac{1}{2}$ loaves.

$$17\frac{1}{2} : 6 :: 2310 : \frac{2310 \times 6}{17\frac{1}{2}} = 792 \text{ loaves} = \text{number the first receives,}$$

$$17\frac{1}{2} : 4\frac{1}{2} :: 2310 : \frac{2310 \times 4\frac{1}{2}}{17\frac{1}{2}} = 594 \text{ " " " second "}$$

$$17\frac{1}{2} : 7 :: 2310 : \frac{2310 \times 7}{17\frac{1}{2}} = 924 \text{ " " " third "}$$

(27)

To produce a mixture worth 8 cents a pound, we require 4 lbs. @ 12 cents, 4 @ 4 cents, 1 @ 5 cents, and 3 @ 9 cents, or 3 lbs. @ 12 cents, 1 @ 4 cents, 4 @ 5 cents, and 4 @ 9 cents, lbs. lbs. lbs. lbs. lbs. lbs.

$$\begin{array}{ll} \text{Then } 4:72 :: 4:72 \text{ lbs. @ 4 cts.} & \text{or } 3:72 :: 1:24 \text{ lbs. @ 4 cts.} \\ 4:72 :: 1:18 \text{ lbs. @ 5 cts.} & 3:72 :: 4:96 \text{ lbs. @ 5 cts.} \\ 4:72 :: 3:54 \text{ lbs. @ 9 cts.} & 3:72 :: 4:96 \text{ lbs. @ 9 cts.} \end{array}$$

(28)

Here $A = \$4444.44$, $r = .0444$, and $t = 4.3\frac{1}{3}$.

$$\text{Then } P = \frac{A}{1+rt} = \frac{\$4444.44}{1+.0444 \times 4.3\frac{1}{3}} = \frac{\$4444.44}{1.19289\frac{1}{3}} = \$3725.764.$$

(29)

$$\$1.00 - \$0.0225 = \$0.9775. \quad \$23470 \div 0.9775 = \$24010.23.$$

(30)

Here $A = \$7493.47$, $r = .07$, and $t = 8$.

$$\text{Then } P = \frac{A}{1+rt} = \frac{7493.47}{1+.07 \times 8} = \frac{7493.47}{1.56} = \$4803.5064.$$

(31)

$$\$17460 \div 1.03125 = \$16930.909 = \text{sum to be invested.}$$

$$16930.909 \div 2.95 = 5739.29 \text{ yds. cloth.}$$

$$16930.900 \times .02\frac{1}{2} = \$423.27272 = \text{ad valorem duty.}$$

$$\$17460 + \$1347.90 + \$479.40 + \$169.83 + \$423.27272 =$$

$$\$19880.40272 = \text{whole cost.}$$

$$\$25000 - \$19880.40272 = \$5119.59728 = \text{whole gain.}$$

$$\text{Then } \$19880.40272 : \$100 :: \$5119.59728 : \frac{5119.59728 \times 100}{19880.40272} =$$

$$27.75 = 27\frac{3}{4} \text{ per cent.}$$

(32)

V.	III.	VIII.	XII.
134234	= 21122021	= 12701	= 3281
5	3	8	12
8	7	10	38
5	3	8	12
44	22	87	464
5	3	8	12
222	68	696	5569 den.
5	3	8	
1113	206	5569 den.	
5	3		
5569 den.	618		
	3		
	1856		
	3		
	5569 den.		

(33)

$$\frac{3}{4} \text{ of } 4\frac{1}{2} \text{ of } \frac{9\frac{1}{2}}{1\frac{1}{2}} \text{ of } \frac{1}{12} \text{ of } \frac{1}{3} \text{ of } £43 \text{ } 18\text{s. } 11\frac{1}{2}\text{d. } £43 \text{ } 18\text{s. } 11\frac{1}{2}\text{d.} =$$

$$\$175.79\frac{1}{2}.$$

(Continued on next page.)

invested.

m duty.

$$- \$423.27272 =$$

whole gain.

$$59728 \times 100 =$$

$$880.40272 =$$

(33 continued.)

$$\frac{3}{4} \text{ of } \frac{1}{2} \text{ of } \frac{3}{4} \text{ of } \frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \$175.79\frac{1}{2} = \frac{3}{4} \text{ of } \frac{3}{4} \text{ of } \frac{15}{16} \text{ of } \frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \$175.79\frac{1}{2} = \frac{1}{2} \text{ of } \$175.79\frac{1}{2} = \$87.8975.$$

$$\frac{3}{4} \text{ of } \frac{1}{17\frac{1}{2}} \text{ of } .56 \text{ of } 1.75 \text{ of } 6\frac{1}{2} \text{ times } \$97.18 =$$

$$\frac{3}{4} \text{ of } \frac{1}{3\frac{1}{2}} \text{ of } \frac{56}{100} \text{ of } \frac{175}{100} \text{ of } 6\frac{1}{2} \text{ times } \$97.18; 6\frac{1}{2} \text{ times } \$97.18 = \$631.67.$$

$$\frac{85}{9} \text{ of } \frac{2}{85} \text{ of } \frac{14}{100} \text{ of } \frac{7}{175} \text{ of } \$631.67 = \frac{49}{9 \times 25} \text{ of } \$631.67 = \frac{49}{225} \text{ of } \$631.67.$$

$$\frac{1}{15} \text{ of } \$631.67 = \$42.1113.$$

$$\text{Then } \$263.6875 - \$42.1113 = \$221.5762 = \text{difference.}$$

(34)

$$\frac{1}{13} = 1 \div 13 \therefore \log. \frac{1}{13} = \log. 1 - \log. 13 = 0 - 1.113943 = -1.113943.$$

$$19.5 = 3 \times 13 \times 5 \div 10 \therefore \log. 19.5 = \log. 3 + \log. 13 + \log. 5 - \log. 10.$$

$$\log. 3 = 0.477121$$

$$\log. 13 = 1.113943$$

$$\log. 5 = \log. 10 - \log. 2 = 1 - 0.301030 \therefore \log. 5 = 0.698970$$

$$\text{Sum} = 2.290043$$

$$\text{From which take } \log. 10 = 1$$

$$\text{Rem.} = 1.290034$$

$$= \log. 19.5.$$

$$1125 = 5^3 \times 3^2 \therefore \log. 1125 = (\log. 5) + 3 + (\log. 3) \times 2.$$

$$\log. 5 = 0.698970 \times 3 = 2.096910$$

$$\log. 3 = 0.477121 \times 2 = 0.954242$$

$$\text{Sum} = 3.051152 = \log. \text{ of } 1125.$$

(Continued on next page.)

$$18s. 11\frac{1}{2}d. =$$

(34 continued.)

$$28 \cdot 16 = 28\frac{1}{2} = 149 = 13^2 \div 6 \therefore \log. 28 \cdot 16 = (\log. 13) \times 2 - (\log. 2 + \log. 3).$$

$$\log. 13 = 1 \cdot 113943 \times 2 = 2 \cdot 227886$$

$$(\log. 2 + \log. 3) = (0 \cdot 301030 + 0 \cdot 477121) = 0 \cdot 778151$$

$$\text{Diff.} = 1 \cdot 449735$$

$$= \log. 28 \cdot 16.$$

$$65000 = 13 \times 5 \times 1000 \therefore \log. 65000 = \log. 13 + \log. 5 + \log. 1000.$$

$$\log. 13 = 1 \cdot 113943$$

$$\log. 5 = 0 \cdot 698970$$

$$\log. 1000 = 3$$

$$\text{Sum} = 4 \cdot 812913 = \log. \text{ of } 65000.$$

$$\log. \cdot 0005 = \log. 5 \text{ with characteristic changed to } -4 = 4 \cdot 698970.$$

$$152 \cdot 1 = 3^2 + 13^2 \div 10 \therefore \log. 152 \cdot 1 = (\log. 3) \times 2 + (\log. 13) \times 2 - \log. 10.$$

$$\log. 3 = 0 \cdot 477121 \times 2 = 0 \cdot 954242$$

$$\log. 13 = 1 \cdot 113943 \times 2 = 2 \cdot 227886$$

$$\text{Sum} = 3 \cdot 182128$$

$$\text{From which take } \log. 10 = 1$$

$$\text{Diff.} = 2 \cdot 182128 = \log. 152 \cdot 1.$$

$$8 \cdot 112 = 2^4 \times 13^2 \times 3 \div 1000 \therefore \log. 8 \cdot 112 = (\log. 2) \times 4 + (\log. 13) \times 2 + \log. 3 - \log. 1000.$$

$$\log. 2 = 0 \cdot 301030 \times 4 = 1 \cdot 204120$$

$$\log. 13 = 0 \cdot 113943 \times 2 = 2 \cdot 227886$$

$$\log. 3 = 0 \cdot 477211$$

$$\text{Sum} = 3 \cdot 909217$$

$$\text{From which take } \log. 1000 = 3$$

$$\text{Diff.} = 0 \cdot 909217 = \log. 8 \cdot 112.$$

$$(\log. 13) \times 2$$

$$\begin{aligned} &= 2.227886 \\ &= 0.778151 \\ &= 1.449735 \end{aligned}$$

$$13 + \log. 5$$

$$5000.$$

$$\text{red to } - 4$$

$$g. 3) \times 2$$

$$\log. 152.1.$$

$$(\log. 2) \times 4$$

$$\log. 8.112.$$

(35)

XII.

$t^2 \times 300 = 21000$	871tet.72 (118.22
$t \times 8 \times 30 = 1800$	6e4
$8^2 = 54$	179tet
22854	159768
$t^2 \times 300 = 2454000$	20352720
$t \times t \times 30 = 22800$	
$t^2 = 84$	
2476884	1e1372e4
$t^2 \times 300 = 249961000$	517428000
$t \times t \times 2 \times 30 = 54500$	
$2^2 = 4$	
2499e5504	4977ttt08
	3e8301e4

(36)

$\frac{1}{2} + \frac{1}{4} + \frac{1}{4} + 5 \text{ years} = \frac{11}{4}$ of life time + 5 years = age at birth of son.
 $\frac{11}{4} - (\frac{1}{2} + 5) = \frac{1}{4}$ of his life time - 5 years = time he lived after birth of son.

$\frac{1}{4}$ of father's life time - 5 years - 4 years = age of son = $\frac{1}{4}$ father's age.

$\frac{1}{4}$ of father's life time - 9 years = $\frac{1}{4}$ father's age.

$\therefore 9$ years is the difference between $\frac{1}{4}$ and $\frac{1}{4}$ of father's age.

$\therefore 9$ years is equal to $\frac{3}{4}$ of father's age.

If 9 years is $\frac{3}{4}$ of his age, $\frac{1}{4}$ will be the $\frac{1}{3}$ of 9 which is 3 years.

If $\frac{1}{4}$ is 3 years, $\frac{3}{4}$ or the whole age will be $3 \times 28 = 84$ years.

Or by Position.

Assume 42 for father's age at death, the son's age = 21.

$\frac{1}{2} + \frac{1}{4} + \frac{1}{4} + 5 = \frac{11}{4} + 5$; $\frac{11}{4}$ of 42 = $16\frac{1}{2}$ and $16\frac{1}{2} + 5 = 21\frac{1}{2}$ = age of father when son was born.

\therefore he lived after birth of his son $42 - 21\frac{1}{2} = 20\frac{1}{2}$ years.

(Continued on next page.)

(36 continued.)

By the question he lived $21 + 4 = 25$ years.The error $25 - 20\frac{1}{2} = -4\frac{1}{2}$.Assume 98 for father's age, then son's age = $\frac{1}{2}$ of 98 = 49. $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + 5 = \frac{3}{2} + 5$; $\frac{1}{2}$ of 98 = $38\frac{1}{2}$, and $38\frac{1}{2} + 5 = 43\frac{1}{2}$
= age of father at birth of son. \therefore he lived after birth of his son $98 - 43\frac{1}{2} = 54\frac{1}{2}$ years.But by the question he lived $49 + 4$ years = 53 years.Then $53 - 54\frac{1}{2} = +1\frac{1}{2}$ = error.

Errors.

$$-4\frac{1}{2} \times 98 = 392$$

$$+1\frac{1}{2} \times 42 = 63$$

$$\text{Sum} = 6 \qquad 504$$

$$504 \div 6 = 84 = \text{father's age.}$$

(37)

m.	fur.	per.	yds.	ft.	in.		fur.	per.	yds.
63	3	7	3	2	7	\div	7	23	$3\frac{1}{2}$
8							40		
507							303		
40							5 $\frac{1}{2}$		
20287							1518 $\frac{1}{2}$		
5 $\frac{1}{2}$							151 $\frac{1}{2}$		
101438							1670 $\frac{1}{2}$		
10143 $\frac{1}{2}$							3		
111581 $\frac{1}{2}$							5010 $\frac{1}{2}$		
3							12		
334746 $\frac{1}{2}$							60129		
12									
4016965									

(Continued on next page.)

(37 continued.)

60139)4018985(66·80578 times
380774

409225

380774

484510

481032

347800

300845

471550

420903

508470

481032

(38)

6·3 ÷ ·000000274

274)8300000000(22992700·72992700

548

820

548

2720

2466

2540

2466

740

548

1920

1918

2000

1918

820

548

2720

2466

2540

2466

740

548

1920

1918

200 remainder.

(39)

$$\frac{1}{2} \text{ yds.} : 6\frac{1}{2} \text{ yds.} :: \$1\frac{1}{2} : \frac{1}{2} \times 11 \times 1\frac{1}{2} = 1\frac{1}{2} = \$5.482.$$

(40)

$$I = Prt = \$4237.71 \times .065 \times 1.67 = \$460.0034205.$$

(41)

$$t = \frac{A - P}{Pr} = \frac{\$1000 - \$674.30}{\$674.30 \times .085} = \frac{325.70}{57.3155} = 5.68258 \text{ years} = 5 \text{ years } 8 \text{ months } 5.7288 \text{ days.}$$

(42)

By Table, page 260, the amount of \$1 for 14 payments at 4 per cent is \$1.73168.

$$\text{Then } \$1.73168 \times 813.71 = \$1409.0853328 = \text{Amount.}$$

$$\text{Subtract } 813.71$$

$$\text{Difference} = 595.3753328 = \text{Interest.}$$

(43)

\$300	\times	0	=	0
700	\times	4	=	2800
750	\times	7	=	5250
850	\times	9	=	7650
400	\times	13	=	5200
1300	\times	19	=	24700
4300	)	45600	(10 months 18 $\frac{2}{3}$ days.	
		4300		
		2600		
		30		
		78000	= days.	
		4300		
		35000		
		34400		
		43/88		

23

— \$

D tog

\$107

De

be di

and L

than 1

gets \$

get, th

+ \$8

\$181

Tha

to \$21

Hence

Then \$

$$P = \frac{A}{1 + \dots}$$

$$\{ (3\frac{1}{2} - \dots$$

$$\{ (.73 \dots$$

$$\{ (3\frac{1}{2} \dots$$

$$= \{ (88 \dots$$

= \$5.482.

0034205.

258 years =

yments at 4

ount.

rest.

18 $\frac{1}{2}$ days.

(44)

23 per cent of \$4200 = $\frac{23}{100}$ of 4200 = \$966.00, and \$4200 — \$966.00 = \$3234.00. E has half as much as A, B, C, and D together; therefore E has *one-third* of \$3234.00, which is \$1078.00.

Deducting E's share, \$1078, from \$3234, the whole sum to be divided, there remains \$2156 to be divided among A, B, C, and D. Now D gets a certain amount; C gets \$42.11 more than D; B gets \$81.34 (42.11 + 19.23) more than D; and A gets \$78.44 (61.34 + 17.10) more than D. Together they get, then, *four times* D's share, together with \$42.11 + \$81.34 + \$8.44, or, in other words, four times D's share, together with \$181.89.

That is, four times D's share, together with \$181.89 is equal to \$2156.

Hence \$2156.00 — \$181.89 = \$1974.11 = four times D's share.

Then \$1974.11 ÷ 4 = \$493.5275 = D's share.

Add 42.11

Sum \$535.6375 = C's share.

Add 19.23

Sum \$554.8675 = B's share.

Add 17.10

Sum \$571.9675 = A's share.

(45)

$$P = \frac{A}{1+rt} = \frac{\$3786.80}{1+1.76} = \frac{3786.80}{2.76} = \frac{378680}{276} = \$1372.02898 +$$

(46)

$$\begin{aligned} & \{ (37 - 276) \times .46 \div \frac{1}{2} \text{ of } .142857 \} \div 8 \frac{1}{2} \text{ times } (\frac{1}{4} + \frac{1}{4} + \frac{1}{4} - \frac{337}{3370}) \\ & \{ (.73 \times .12345 \div \frac{1}{188}) + \frac{1}{2} + 9\frac{3}{4} + 17\frac{1}{11} \} \div 27.4922077 \\ & = \{ (378 - 276) \times \frac{1}{18} \div \frac{1}{2} \text{ of } \frac{1}{2} \} \div \frac{1}{12} \times (\frac{1}{2} + \frac{1}{2} + \frac{1}{2} - \frac{337}{3370}) \\ & \{ (378 \times \frac{1}{18888} \div \frac{1}{188}) + \frac{1}{2} + 9\frac{3}{4} + 17\frac{1}{11} \} \div 27.4922077 \end{aligned}$$

(Continued on next page.)

$$* rt = .16 \times 11 = 1.76.$$

(46 continued.)

$$\begin{aligned}
 &= \frac{(44 \times 44 \times 4 \times 4) \times 4 \times 4 \times 4}{\{(44 \times 44 \times 4 \times 4) + 27444\} \div 27 \cdot 4922077} \\
 &= \frac{44 \times 4 \times 4}{(44 + 27444) \div 27 \cdot 4922077} = \frac{1}{27444 \div 27 \cdot 4922077} \\
 &= \frac{1}{27 \cdot 4922077 \div 27 \cdot 4922077} = \frac{1}{1} = 1
 \end{aligned}$$

(47)

312312302 quaternary = 224690 decimal scale.

2312132 quaternary = 11678 decimal scale.

Sum = 236368

4234 quinary = 569 decimal, and $569 \times 23011 = 13093259$. $236368 \times 13093259 = 3094827443312$. $555 + 444 + 333 + 222 + 111$ senary = 2553 senary = 645 decimal. $3094827443312 - 645 = 3094827442667$.

6542 septenary = 2333 decimal.

 $3094827442667 \div 2333 = 13265441241334$ den.

X.	VIII.
1326544124	= 11704272374

X.	VIII.
1375	= 2537

X.	VIII.
2333	= 4435

X.	VIII.
$\therefore 13265441241334$	= 117042723744437

(48)

$$\cdot 1 = \frac{1}{10} \text{ and } (\frac{1}{10})^2 = \frac{1}{100} = \cdot 01$$

$$\cdot 1 = \frac{1}{4} \text{ and } (\frac{1}{4})^2 = \frac{1}{16} = \cdot 012345679.$$

Page

Assum

$$t = \frac{1}{\log}$$

20 mi

1749600 =
multi

$$\frac{96}{2}$$

A can do
in 1 day.
fore they ca
in 1 day, an
whole work
= 8½ days.

FIFTH SERIES.

(50)

Assume 27 | 2..2..18..2X..48 and 81; strike out 2, 9 and 16, since they are contained as factors in the others.

$$\text{The l. c. m.} = 27 \times 16 \times 3 = 1296.$$

(51)

$$t = \frac{\log. n}{\log. (1+r)} = \frac{\log. 7}{\log. (1.06)} = \frac{0.845098}{0.025306} = 33.395 \text{ years.}$$

(52)

20 miles = 1267200 inches; and 14 ft. 10 in. = 178 inches.
 $1267200 \div 178 = 7119\frac{2}{3}$ times.

(53)

$1749600 = 2^5 \times 3^7 \times 5^2$; increasing each index by unity and multiplying, we have $6 \times 8 \times 3 = 144$.

(54)

$$\begin{aligned} \frac{3}{2} \text{ of } \frac{96}{\frac{3}{2}} \div \frac{\frac{1}{2} \text{ of } 7}{3\frac{1}{2}} &= \frac{3}{2} \times \frac{24}{\frac{7}{2}} \div \frac{\frac{7}{2}}{3\frac{1}{2}} = \frac{3}{2} \times \frac{48}{7} \div \frac{7}{7} \\ &= \frac{3}{2} \times \frac{48}{7} \div \frac{7}{7} = \frac{3}{2} \times \frac{48}{7} \times \frac{1}{1} = 35\frac{1}{2}. \end{aligned}$$

(55)

A can do the whole work in 12 days, therefore he can do $\frac{1}{12}$ in 1 day. A and B together can do the work in 5 days, therefore they can do $\frac{1}{5}$ in 1 day. Therefore B can do $\frac{1}{5} - \frac{1}{12} = \frac{7}{60}$ in 1 day, and he will require as many times 1 day to do the whole work as $\frac{60}{7}$ is contained times in 1, i. e. $1 \div \frac{7}{60} = \frac{60}{7} = 8\frac{4}{7}$ days.

(56)

$$P = \frac{A}{(1+r)^t}; \log. P = \log. A - \log. (1+r) \times t = \log. 8899.77 \\ - \log. (1.06) \times 22 = 3.949378 - 0.025306 \times 22 \\ = 3.949378 - 0.556732 = 3.392646, \text{ and } \log. 3.392646 \\ = \$2469.71.$$

By Table, page 260, amount of \$1 at 6 per cent. for 22 payments = 3.60354.

$$\text{Then } \$8899.77 \div 3.60354 = \$2469.73 \text{ nearly.}$$

(57)

Let the 1st number be 2. Then $2 \times 2 = 4$

$$1\frac{1}{2} \times 3 = 4$$

$$10 - (2 + 1\frac{1}{2}) = 10 - 3\frac{1}{2} = 6\frac{1}{2} + 4 = 26\frac{1}{2}, \text{ but it should equal 4.}$$

$$\text{Therefore } 26\frac{1}{2} - 4 = +22\frac{1}{2} = \text{error.}$$

Let $1\frac{1}{2}$ be the 1st number; then $1\frac{1}{2} \times 2 = 3$

$$1 \times 3 = 3$$

$$10 - (1\frac{1}{2} + 1) = 10 - 2\frac{1}{2} = 7\frac{1}{2} \times 4 = 30, \text{ but it should} = 3.$$

$$\text{Therefore } 30 - 3 = +27 = \text{error.}$$

Errors.

$$+ 27 \times 2 = 54$$

$$+ 22\frac{1}{2} \times 1\frac{1}{2} = 44$$

$$\text{Diff.} = 4\frac{1}{2} \quad \text{diff.} = 20, \text{ and } 20 \div 4\frac{1}{2} = 4\frac{2}{3} = \text{1st number.}$$

$$4\frac{2}{3} \times 2 = 9\frac{2}{3} = \text{1st product.}$$

$$\text{Second number} = 9\frac{2}{3} \div 3 = 3\frac{1}{3} \times 3 = 9\frac{2}{3} = \text{2nd product.}$$

$$10 - 7\frac{1}{3} = 2\frac{2}{3} \times 4 = 9\frac{2}{3} = \text{3rd product.}$$

(58)

Suppose A has 40; then B has $110 - 40 = 70$, and C has $130 - 70 = 60$.

A and C together have $40 + 60 = 100$, but it should be 120.

$$\text{Therefore } 100 - 120 = -20 = \text{error.}$$

Suppose A has 80; then B has $110 - 80 = 30$, and C has $130 - 30 = 100$.

A and C together have $80 + 100 = 180$, but they should have 120.

$$\text{Therefore } 180 - 120 = +60 = \text{error.}$$

(Continued on next page.)

(53 continued.)

Errors.

$$+ 60 \times 40 = 2400$$

$$- 20 \times 80 = 1600$$

$$\text{Sum} = 80$$

$$\text{Sum} = 4000$$

$$4000 \div 80 = 50 = \text{number A has.}$$

Then B has $110 - 50 = 60$, and C has $130 - 60 = 70$.

$$50 + 60 + 70$$

$$\frac{\quad}{3} = 60 = \text{each man's share when equally divided.}$$

(59)

$$\text{Formula I, p. 333. } l = a + (n - 1) d = 7 + (47 - 1) \times 4 \\ = 7 + 46 \times 4 = 7 + 184 = 191.$$

$$\text{Formula VI, p. 333. } s = \left\{ 2a + (n - 1) d \right\} \frac{n}{2} \\ = \left\{ 2 \times 7 + (93 - 1) \times 4 \right\} \frac{93}{2} = \left\{ 14 + (92 \times 4) \right\} \frac{93}{2} \\ = (14 + 368) \times \frac{93}{2} = \frac{382 \times 93}{2} = 17763.$$

(60)

$$t = \frac{\log. n}{\log. (1 + r)} = \frac{\log. 21}{\log. (1.07)} = \frac{1.322219}{0.029384} = 44.997 \text{ years.}$$

SIXTH SERIES.

(61)

B gets \$196.87 more than C, and A gets $\$387 + \$196.87 = \$583.87$ more than C, therefore together they get *three* times C's share, together with \$196.87 + \$583.87, i. e. three times C's share, together with \$780.74; but together they get \$3700.

Therefore \$3700 = three times C's share, together with \$780.74, or $\$3700 - \$780.74 = \$2919.26 = \text{three times C's share.}$

Hence $\$2919.26 \div 3 = \$973.08\frac{2}{3} = \text{C's share.}$

$$\text{Add } 196.87$$

$$\text{Sum} = \$1169.95\frac{1}{3} = \text{B's share.}$$

$$\text{Add } 387.00$$

$$\text{Sum} = \$1556.95\frac{1}{3} = \text{C's share.}$$

(66)

$$\begin{aligned} & \text{of } 4\frac{1}{2} \text{ of } \frac{59}{14} \text{ of } \frac{1}{2} \text{ of } £3 \text{ 16s. 1}\frac{1}{2}\text{d.} = \frac{2}{8} \times \frac{9}{2} \times \frac{59 \times 14}{7 \times 11} \times \frac{1}{6} \\ & \times \$15.39\frac{1}{2} = 6 \text{ times } \$15.39\frac{1}{2} = \$92.35. \end{aligned}$$

$$\frac{1}{11} \text{ of } 4\frac{1}{2} \text{ of } \frac{19\frac{1}{2}}{34} \text{ of } \frac{9A}{117} \text{ of } \frac{1}{11} \text{ of } .85 \text{ of } \frac{1}{42\frac{1}{2}} \text{ of } \$1783$$

$$= \frac{1}{11} \times \frac{23}{2} \times \frac{22}{12} \times \frac{9A}{117} \times \frac{1}{11} \times \frac{85}{100} \times \frac{2}{35} \text{ of } \$1783.$$

$$= \frac{8}{11} \times \frac{23}{5} \times \frac{78}{19} \times \frac{95}{117} \times \frac{11}{23} \times \frac{85}{100} \times \frac{2}{85} \times \frac{17.83}{1}$$

$$= \$17.83 \times 4 = \$71.32. \quad \$92.35 - \$71.32 = \$21.03.$$

(67)

$$\begin{aligned} 7 : 13 &= 7 \div 13 = .538 \\ 9 : 16 &= 9 \div 16 = .562 \\ 8 : 15 &= 8 \div 15 = .533 \\ 10 : 19 &= 10 \div 19 = .526 \end{aligned}$$

Therefore 9 : 16 is the greatest, and 10 : 19 is the least.

$$\text{Compound ratio} = \frac{7}{13} \times \frac{9}{16} \times \frac{8}{15} \times \frac{10}{19} = \frac{21}{247} = 21:247.$$

(68)

$$67.432 = 67 \frac{432}{1000} = \frac{66744}{1000} \text{ and } 7.9036 = 7 \frac{9036}{1000} = \frac{79036}{1000}$$

$$\frac{66758}{990} \div \frac{78957}{9990} = \frac{66758}{999} \times \frac{9990}{78957} = \frac{7410138}{868527} = 8.5318452.$$

(69)

9 per. 9 yds. 7 ft. 120 in. = 365628 inches

 $\frac{1}{3}$ of $\frac{1}{3}$ of $\frac{1}{3}$ of 35 acres 2 roods = $\frac{1}{27}$ of 35 acres 2 roods = $\frac{1}{27}$ of 222678720 inches

$$\frac{365628}{\frac{1}{27} \text{ of } 222678720} = \frac{2559396}{133607232} = 0.019156118.$$

(70)

Dissimilar.

Similar.

17.0342

17.03424242

27.06357

27.06357575

98.123456

98.123456456

829.6423

829.642342342

986.1234298

986.1234298429

9.876342

9.876342876342

813.9864234567

813.9864234567

Similar and Coterminous.

17.034242424242424242

27.063575757575757575

98.123456456456456456

829.642342342342342342

986.123429842984298429

9.876342876342876342

813.986423456745674567

4 carried

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SEVENTH SERIES.

(73)

$$\begin{array}{r}
 \cdot \cdot \cdot \cdot \cdot \\
 401241 \cdot 3424 \quad (422 \cdot 32) \\
 31 \\
 \hline
 132 \quad) \quad 412 \\
 \quad \quad 314 \\
 \hline
 1342 \quad) \quad 4341 \\
 \quad \quad 3234 \\
 \hline
 13443 \quad) \quad 110234 \\
 \quad \quad 101434 \\
 \hline
 140012 \quad) \quad 330024 \\
 \quad \quad 330024.
 \end{array}$$

(74)

Suppose father's age = 60, the son's age now = $60 \div 5 = 12$,
 and son's age four years ago = $12 - 4 = 8$. But the son's
 age four years ago should, by the question, have been $60 \div$
 $7 = 8\frac{1}{2}$.

Therefore $8 - 8\frac{1}{2} = -\frac{1}{2} = \text{error}$.

Suppose father's age = 35; then son's age now = $35 \div 5 = 7$,
 and age four years ago = $7 - 4 = 3$.
 But son's age four years ago should, by question, have been 35
 $\div 7 = 5$.

Therefore $3 - 5 = -2 = \text{error}$.

Errors.

$$-2 \times 60 = 120$$

$$-\frac{1}{2} \times 35 = 20$$

$$\text{diff. } 1\frac{1}{2} \quad \text{diff.} = 100$$

$$100 \div 1\frac{1}{2} = 70 = \text{father's and son's age} = 70 \div 5 = 14.$$

(75)

$$.72347 \div .0032 = \frac{72275}{99900} \div \frac{32}{9900} =$$

$$\frac{72275}{99900} \times \frac{11}{32} = \frac{795025}{3552} = 223.82460585.$$

(76)

Logarithm of 97294764.372 is 7.988089

$$7.988089 \div 11 = 0.726189$$

Log. 0.726189 = 5.32341 = 11th root of 97294764.372.

(77)

Assume 43½ for the greater number

$$7\frac{1}{2} : 3\frac{1}{2} :: 43\frac{1}{2} : \frac{43\frac{1}{2} \times 3\frac{1}{2}}{7\frac{1}{2}} = 21 \text{ the less}$$

$$43\frac{1}{2} - 21 = 22\frac{1}{2} \text{ but it should} = 30$$

$$\text{Therefore error} = 22\frac{1}{2} - 30 = -7\frac{1}{2}.$$

Assume 72½ for the greater number

$$7\frac{1}{2} : 3\frac{1}{2} :: 72\frac{1}{2} : \frac{72\frac{1}{2} \times 3\frac{1}{2}}{7\frac{1}{2}} = 35 = \text{the less}$$

$$72\frac{1}{2} - 35 = 37\frac{1}{2} \text{ but it should} = 30$$

$$\text{Therefore error} = 37\frac{1}{2} - 30 = +7\frac{1}{2}.$$

Errors.

$$+ 7\frac{1}{2} \times 43\frac{1}{2} = 326\frac{1}{4}$$

$$- 7\frac{1}{2} \times 72\frac{1}{2} = 543\frac{1}{4}$$

$$\text{Sum} = 15 \quad \text{Sum} = 870$$

$$870 \div 15 = 58 \text{ greater}$$

$$7\frac{1}{2} : 3\frac{1}{2} :: 58 : \frac{58 \times 3\frac{1}{2}}{7\frac{1}{2}} = 28 \text{ less.}$$

(78)

Assume 35	35, 16	18, 24, 32, 48, 40
Assume 16	16	18, 24, 32, 9, 8
Assume 9		2, 31, 4
		31

$$l. c. m. = 35 \times 16 \times 9 \times 31 = 156240$$

(79)

Here $a = 1$, $d = 6$, $n = 101$,

$$s = \left\{ 2a + (n-1)d \right\} \frac{n}{2} = \left\{ 2 \times 1 + (101-1) \times 6 \right\} \frac{101}{2}$$

$$= (2 + 600) \frac{101}{2} = \frac{602 \times 101}{2} = 30401.$$

(80)

$$\begin{array}{cccccccc} 4 & & 5 & & & & & \\ 19 & 11 & 85 & 117 & 8 & 47 & 117 \times 4 \times 5 & 2284 \\ \times & \times & \times & \times & \times & \times & = & \\ 7 & 58 & 121 & 29 & 43 & 3 & 7 \times 7 \times 11 \times 3 & 1617 \end{array}$$

$$= 2284 : 1617.$$

(82)

$$\frac{(\{9\frac{1}{2} + 4\frac{1}{2} + 3\frac{1}{2} - 16\frac{3}{4}\} \times .54) \div 1\frac{1}{2} \times 35 \text{ times } .142857}{\{.97 \times .24378 \times (1\frac{1}{4} \times 4\frac{1}{2})\} \times (4\frac{1}{2} - 2\frac{1}{2})}$$

$$= \frac{(\{16\frac{3}{4} - 16\frac{3}{4}\} \times \frac{1}{4}) \div 1\frac{1}{2} \times 35 \times \frac{1}{2}}{.88 \times .24378 \times 1\frac{1}{4} \times \frac{1.875}{.561} \times (4\frac{1}{2} - 2\frac{1}{2})}$$

$$= \frac{1\frac{1}{2} \times .2 \times 1\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}}{1\frac{1}{2} \times \frac{1.875}{.561} \times 1\frac{1}{4} \times \frac{1.875}{.561} \times 1\frac{1}{2}} = \frac{1}{1\frac{1}{2}} = \frac{2}{3}$$

(83)

Suppose the *hour* hand moves over 4 minutes, then since the minute hand moves 12 times as fast, it will have travelled over 48 minutes. But in order to overtake the hour hand, the minute hand must traverse the entire circle, 60 minutes, plus the 4 minutes we have supposed the hour hand to have moved forward, *i. e.* 64 minutes. Then 48 should equal 64, for we should find the same number by each process; $48 - 64 = -16$ error.

Suppose hour hand moves over 6 minutes, the minute hand moves over $6 \times 12 = 72$ minutes. But minute hand moves over $60 + 6 = 66$ minutes.

Then $72 - 66 = +6$ error.

(Continued on next page.)

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3

∴ Log.

∴ Log.

Log.

1.

Log. 1

93

∴ Log. 9

Simple Int

Amount O

= \$70

Int.

\$98.814 -

(83 continued.)

Errors.

$$- 16 \times 6 = 96$$

$$+ 6 \times 4 = 24$$

$$\text{Sum } 22 \quad \text{Sum } 120$$

$120 \div 22 = 5\frac{5}{11}$ min. = minutes passed over by the hour hand,
hence space passed over by the minute hand = $5\frac{5}{11} \times 12$
= $65\frac{5}{11}$ min. = 1 hour $5\frac{5}{11}$ min. = time.

(84)

$$\text{Log. } 5 = \text{log. } 10 - \text{log. } 2 = 1 - 0.301030 = 0.698970$$

$$3850000 = 5 \times 7 \times 11 \times 10000.$$

$$\therefore \text{Log. } 3850000 = \text{log. } 5 + \text{log. } 7 + \text{log. } 11 + \text{log. } 10000$$

$$= 0.698970 + 0.845098 + 1.041393 + 4 = 6.585461.$$

$$3181.81 = 31.81 \times 100 = 31\frac{81}{100} \times 100 = 31\frac{81}{100} \times 100.$$

$$\therefore \text{Log. } 3181.81 = \text{log. } 5 + \text{log. } 7 + \text{log. } 1000 - \text{log. } 11$$

$$= 0.698970 + 0.845098 + 3 - 1.041393 = 3.502675$$

$$.0000154 = 2 \times 7 \times 11 \div 10000000.$$

$$\therefore \text{Log. } .0000154 = \text{log. } 2 + \text{log. } 7 + \text{log. } 11 - \text{log. } 10000000$$

$$= 0.301030 + 0.845098 + 1.041393 - 7 = 5.187521.$$

$$\text{Log. } \frac{1}{77} = \text{log. } 1 - (\text{log. } 7 + \text{log. } 11) = 0 - (0.845098$$

$$+ 1.041393, = 0 - 1.886491 = 2.113509.$$

$$1.571428 = 14 = 1\frac{1}{7}.$$

$$\text{Log. } 1.571428 = \text{log. } 11 - \text{log. } 7 = 1.041393 - 0.845098$$

$$= 0.196295$$

$$93.17 = 9317 \div 100 = 11^3 \times 7 \div 100.$$

$$\therefore \text{Log. } 9317 = 3 \text{ times log. } 11 + \text{log. } 7 - \text{log. } 100 = 1.041393$$

$$\times 3 + 0.845098 - 2 = 1.969277.$$

EIGHTH SERIES.

(85)

$$\text{Simple Interest} = Prt = \$700 \times .045 \times 3 = \$94.50.$$

$$\text{Amount Compound Interest} = P(1+r)^3 = \$700 \times (1.045)^3$$

$$= \$700 \times 1.14116 = \$798.814 - \$700 = \$98.814 = \text{Comp.}$$

Int.

$$\$98.814 - \$94.50 = \$4.314.$$

(86)

X's gain = $\frac{1}{12}$, and Z's = $\frac{1}{4}$; \therefore Y's gain = $1 - (\frac{1}{12} + \frac{1}{4})$
 $= 1 - \frac{1}{3} = \frac{2}{3}$.

X's gain is $\frac{1}{12}$ for 3 months, therefore for 1 month it is $\frac{1}{36}$.

Y's gain is $\frac{2}{3}$ for 9 months, " " " $\frac{2}{27}$.

Z's gain is $\frac{1}{4}$ for 4 months, " " " $\frac{1}{16}$.

$\frac{1}{36} : \frac{1}{16} :: \$3024 : \$3024 \times \frac{1}{36} \times \frac{1}{16} = \$672 = X's \text{ stock.}$

$\frac{1}{36} : \frac{1}{16} :: \$3024 : \$3024 \times \frac{1}{36} \times \frac{1}{16} = \$1120 = Y's \text{ stock.}$

(87)

$\frac{3}{8} \times \sqrt{17} \div (1\frac{1}{2})^3 = \frac{3}{8} \times \sqrt{\frac{16}{9}} \div (\frac{3}{2})^3 = \frac{3}{8} \times \frac{4}{3} \times \frac{8}{27} = \frac{4}{27}$.

(88)

$4^2 = 16 \times 300$	=	4800	80677568161 (4321 cube rt.
$4 \times 2 = 12 \times 30$	=	360	64
3^2	=	9	16677
		5169	15507
$43^2 = 1849 \times 300$	=	554700	1170568
$43 \times 2 = 86 \times 30$	=	2580	
2^2	=	4	
		557284	1114568
$432^2 = 186624 \times 300$	=	55987200	56000161
$432 \times 1 = 432 \times 30$	=	12960	
1^2	=	1	
		56000161	56000161

(89)

$$7 = \left\{ \begin{array}{l} 8 - 1 \\ \quad \quad \quad \begin{array}{l} 3 + 4 \\ 1 + 6 \end{array} \end{array} \right\} = 7$$

4 lbs. at 8d.

1 lb. at 4d.

1 lb. at 6d.

} Make a mixture of 6 lbs. at 7d.

$$6 : 112 :: 4 : \frac{112 \times 4}{8} = 74\frac{2}{3} \text{ at 8d.}$$

(Continued on next page.)

Assum

Since

And 1

And 2

+

And 3

+

Assum

Since 1

And 1s

+

And 2n

+

And 3r

+

Diff. = 1

6573

— ($\frac{1}{12} + \frac{1}{4}$)

t is $\frac{1}{36}$.

" $\frac{6}{108}$.

" $\frac{1}{4}$.

stock.

's stock.

$\frac{8}{17} = \frac{4}{8.5}$.

1321 cube rt.

(89 continued.)

$$6 : 112 :: 1 : \frac{112 \times 1}{6} = 18\frac{2}{3} \text{ at 4d.}$$

$$6 : 112 :: 1 : \frac{112 \times 1}{6} = 18\frac{2}{3} \text{ at 6d.}$$

(90)

Assume 40 as the sum of the three numbers.

Since $1\text{st} + 2\text{nd} + 3\text{rd} = 40$,

And $1\text{st} + \frac{1}{4}(2\text{nd} + 3\text{rd}) = 34 \therefore \frac{1}{4}(2\text{nd}$

$+ 3\text{rd}) = 6 \dots\dots\dots \therefore 2\text{nd} + 3\text{rd} = 12$

And $2\text{nd} + \frac{1}{3}(1\text{st} + 3\text{rd}) = 34 \therefore \frac{1}{3}(1\text{st}$

$+ 3\text{rd}) = 6 \dots\dots\dots \therefore 1\text{st} + 3\text{rd} = 9$

And $3\text{rd} + \frac{1}{4}(1\text{st} + 2\text{nd}) = 34 \therefore \frac{1}{4}(1\text{st}$

$+ 2\text{nd}) = 6 \dots\dots\dots \therefore 1\text{st} + 2\text{nd} = 8$

$$\text{Adding, } 2 \times (1\text{st} + 2\text{nd} + 3\text{rd}) = 29$$

$$\therefore 1\text{st} + 2\text{nd} + 3\text{rd} = 14\frac{1}{2}.$$

But the sum should equal 40.

$$\text{Hence } 14\frac{1}{2} - 40 = -25\frac{1}{2}.$$

Assume 48 as the sum of the three numbers.

Since $1\text{st} + 2\text{nd} + 3\text{rd} = 48$.

And $1\text{st} + \frac{1}{4}(2\text{nd} + 3\text{rd}) = 34 \therefore \frac{1}{4}(2\text{nd}$

$+ 3\text{rd}) = 14 \dots\dots\dots \therefore 2\text{nd} + 3\text{rd} = 28$

And $2\text{nd} + \frac{1}{3}(1\text{st} + 3\text{rd}) = 34 \therefore \frac{1}{3}(1\text{st}$

$+ 3\text{rd}) = 14 \dots\dots\dots \therefore 1\text{st} + 3\text{rd} = 21$

And $3\text{rd} + \frac{1}{4}(1\text{st} + 2\text{nd}) = 34 \therefore \frac{1}{4}(1\text{st}$

$+ 2\text{nd}) = 14 \dots\dots\dots \therefore 1\text{st} + 2\text{nd} = 18\frac{2}{3}$

$$\text{Adding, } 2 \times (1\text{st} + 2\text{nd} + 3\text{rd}) = 67\frac{2}{3}$$

$$\therefore 1\text{st} + 2\text{nd} + 3\text{rd} = 33\frac{1}{3}.$$

But the sum should equal 48.

$$\text{Hence } 33\frac{1}{3} - 48 = -14\frac{2}{3} = \text{error.}$$

Errors.

$$-25\frac{1}{2} \times 48 = 1224$$

$$-14\frac{2}{3} \times 40 = 566\frac{2}{3}$$

$$\text{Diff.} = 11\frac{1}{3} \qquad \text{Diff.} = 657\frac{1}{3}$$

$$657\frac{1}{3} \div 11\frac{1}{3} = 58 = \text{the sum of the three numbers.}$$

(Continued on next page.)

(90 continued.)

$$1\text{st} + \frac{1}{2}(2\text{nd} + 3\text{rd}) = 34 \therefore \frac{1}{2}(2\text{nd} + 3\text{rd}) = 58 - 34 = 24$$

$$\therefore 2\text{nd} + 3\text{rd} = 48.$$

$$2\text{nd} + \frac{1}{3}(1\text{st} + 3\text{rd}) = 34 \therefore \frac{1}{3}(1\text{st} + 3\text{rd}) = 58 - 34 = 24$$

$$\therefore 1\text{st} + 3\text{rd} = 36.$$

$$1\text{st} + 2\text{nd} + 3\text{rd} = 58, \text{ and } 2\text{nd} + 3\text{rd} = 48 \therefore 1\text{st} = 10.$$

$$1\text{st} + 2\text{nd} + 3\text{rd} = 58, \text{ and } 1\text{st} + 3\text{rd} = 36 \therefore 2\text{nd} = 22.$$

$$2\text{nd} + 3\text{rd} = 48, \text{ and } 2\text{nd} = 22 \therefore 3\text{rd} = 26.$$

(91)

4 means + 2 extremes = 6 terms.

$$\text{Formula IX, p. 333. } d = \frac{l - a}{n - 1} = \frac{40 - 1}{6 - 1} = \frac{39}{5} = 7\frac{4}{5}.$$

$$1, 8\frac{1}{5}, 16\frac{2}{5}, 24\frac{3}{5}, 32\frac{4}{5}, 40.$$

(92)

$$s = 1860040, l = 1240029, \text{ and } r = 3.$$

$$\text{Formula XI, p. 340. } a = rl - (r - 1)s = 1240029 \times 3$$

$$- 2 \times 1860040 = 3720087 - 3720080 = 7.$$

(93)

$$6 \text{ apples} + 7 \text{ pears cost } 33 \text{ pence} \therefore 2 \text{ apples} + 2\frac{1}{2} \text{ pears cost } 11 \text{ pence.}$$

$$10 \text{ apples} + 8 \text{ pears cost } 44 \text{ pence} \therefore 2 \text{ apples} + 1\frac{1}{2} \text{ pears cost } 8\frac{1}{2} \text{ pence.}$$

$$\text{Subtract, and } 2\frac{1}{2} - 1\frac{1}{2} \text{ pears cost } 11\text{d.} - 8\frac{1}{2}\text{d.}$$

$$\text{That is, } \frac{1}{2} \text{ of a pear costs } 2\frac{1}{2}\text{d.}$$

$$\text{If } \frac{1}{2} \text{ cost } \frac{1}{2}\text{d., } \frac{1}{1} \text{ will cost } \frac{1}{1} \text{ of } \frac{1}{2}\text{d., which is } \frac{1}{2}\text{d.}$$

$$\text{If } \frac{1}{2} \text{ cost } \frac{1}{2}\text{d., } \frac{1}{4} \text{ will cost } \frac{1}{4}\text{d.} = 3\text{d.}$$

$$6 \text{ apples} + 7 \text{ pears cost } 33 \text{ pence, and } 7 \text{ pears cost } 21\text{d.} \therefore 6$$

$$\text{apples cost } 12\text{d. and } 1 \text{ apple costs } 2\text{d.}$$

(94)

$$\frac{1}{2} \times \frac{1}{3} \times \frac{5}{9} \times \frac{57}{\frac{57}{2}} \times \frac{2}{3} \times \frac{4}{5} \times \frac{3}{4}$$

$$= \frac{1}{2} \times \frac{2}{4} \times \frac{5}{9} \times \frac{57}{12} \times \frac{2}{3} \times \frac{4}{5} \times \frac{3}{4} = \frac{19}{2 \times 4 \times 3 \times 2} = \frac{19}{48}.$$

$$3 - 34 = 24$$

$$3 - 34 = 24$$

$$1\text{st} = 10.$$

$$2\text{nd} = 22.$$

$$26.$$

$$= 7\frac{1}{2}.$$

$$240029 \times 3$$

$$\text{pears cost}$$

$$\text{pears cost}$$

$$21d. \dots 6$$

$$\frac{19}{48} \times 2$$

(95)

$$\$10 = \frac{1}{4} \text{ of 2nd rem.} - \$20 \therefore \frac{1}{4} \text{ of 2nd rem.} = \$30 \therefore 2\text{nd rem.} = \$40.$$

$$\$40 = \frac{1}{4} \text{ of 1st rem.} - \$30 \therefore \frac{1}{4} \text{ of 1st rem.} = \$70 \therefore 1\text{st rem.} = \$87.50.$$

$$\$87.50 = \frac{1}{4} \text{ of original sum} - \$50 \therefore \frac{1}{4} \text{ of original sum} = \$137.50 \therefore \text{original sum} = \$137.50 \times 2 = \$275.$$

(96)

$$a = 60, n = 17, \text{ and } d = 4.$$

$$\text{Formula VI, p. 333. } s = \left\{ 2a + (n-1)d \right\} \frac{n}{2}$$

$$= \left\{ 2 \times 60 + (17-1) \times 4 \right\} \frac{17}{2} = (120 + 64) \times \frac{17}{2}$$

$$= \frac{184 \times 17}{2} = \$1564 = \text{sum received for 17 years.}$$

$$\text{Formula I, p. 333. } l = a + (n-1)d = 60 + (17-1) \times 4 = 60 + 64 = \$124 = \text{wages for 17th year.}$$

NINTH SERIES.

(98)

$$\pounds 749 \text{ 16s. 5}\frac{1}{2}\text{d.} = \pounds 749.823958; \pounds 1 \text{ Sterling} = \$4.867$$

$$\pounds 749.823958 \times 4.867 = \$3649.3932.$$

(99)

$$\begin{array}{r} 2 \overline{)177408} \\ \underline{4} \\ 2 \overline{)88704} \\ \underline{16} \\ 2 \overline{)44352} \\ \underline{88} \\ 2 \overline{)22176} \\ \underline{44} \\ 2 \overline{)11088} \\ \underline{22} \\ 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)88704} \\ \underline{16} \\ 2 \overline{)44352} \\ \underline{88} \\ 2 \overline{)22176} \\ \underline{44} \\ 2 \overline{)11088} \\ \underline{22} \\ 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)44352} \\ \underline{88} \\ 2 \overline{)22176} \\ \underline{44} \\ 2 \overline{)11088} \\ \underline{22} \\ 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)22176} \\ \underline{44} \\ 2 \overline{)11088} \\ \underline{22} \\ 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)11088} \\ \underline{22} \\ 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)5544} \\ \underline{44} \\ 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)2772} \\ \underline{44} \end{array}$$

$$\begin{array}{r} 2 \overline{)1386} \\ \underline{4} \\ 2 \overline{)693} \\ \underline{13} \\ 2 \overline{)346.5} \\ \underline{69} \\ 2 \overline{)173.25} \\ \underline{34} \\ 2 \overline{)86.625} \\ \underline{17} \\ 2 \overline{)43.3125} \\ \underline{8} \\ 2 \overline{)21.65625} \\ \underline{4} \\ 2 \overline{)10.828125} \\ \underline{2} \end{array}$$

$$\begin{array}{r} 2 \overline{)693} \\ \underline{13} \\ 2 \overline{)346.5} \\ \underline{69} \\ 2 \overline{)173.25} \\ \underline{34} \\ 2 \overline{)86.625} \\ \underline{17} \\ 2 \overline{)43.3125} \\ \underline{8} \\ 2 \overline{)21.65625} \\ \underline{4} \\ 2 \overline{)10.828125} \\ \underline{2} \end{array}$$

$$\begin{array}{r} 2 \overline{)346.5} \\ \underline{69} \\ 2 \overline{)173.25} \\ \underline{34} \\ 2 \overline{)86.625} \\ \underline{17} \\ 2 \overline{)43.3125} \\ \underline{8} \\ 2 \overline{)21.65625} \\ \underline{4} \\ 2 \overline{)10.828125} \\ \underline{2} \end{array}$$

$$\begin{array}{r} 2 \overline{)173.25} \\ \underline{34} \\ 2 \overline{)86.625} \\ \underline{17} \\ 2 \overline{)43.3125} \\ \underline{8} \\ 2 \overline{)21.65625} \\ \underline{4} \\ 2 \overline{)10.828125} \\ \underline{2} \end{array}$$

$$\begin{array}{r} 2 \overline{)86.625} \\ \underline{17} \\ 2 \overline{)43.3125} \\ \underline{8} \\ 2 \overline{)21.65625} \\ \underline{4} \\ 2 \overline{)10.828125} \\ \underline{2} \end{array}$$

$$2^8 \times 3^2 \times 7 \times 11.$$

(100)

Formula III, page 354, $r = \sqrt{\frac{A}{P}} - 1 \therefore r + 1 = \sqrt{\frac{A}{P}}$

$$\text{Log. } (r + 1) = (\text{log. } A - \text{log. } P) \div t$$

$$\begin{aligned} \text{That is, log. } (r + 1) &= (\text{log. } 11111 \cdot 11 - \text{log. } 704) \div 11 \\ &= (4 \cdot 045757 - 2 \cdot 847573) \div 11 \\ &= 1 \cdot 198184 \div 11 = 0 \cdot 108925 \end{aligned}$$

Therefore $r + 1 =$ natural number corresponding to the logarithm $0 \cdot 108925$ which is $1 \cdot 285$.

Since $r + 1 = 1 \cdot 285$, $r = \cdot 285 =$ rate per unit and rate per cent. $= \cdot 285 \times 100 = 28\frac{1}{2}$.

(101)

If 9 be $\frac{1}{13}$, $\frac{1}{13}$ or the whole will equal $9 \times 13 = 117$.

(102)

3 gal. + 4 gal. + 7 gal. = 14 gal.

Hence 14 gal. : 292 gal. :: 3 gal. : $\frac{292 \times 3}{14} = 62\frac{1}{2}$ of 1st kind.

14 gal. : 292 gal. :: 4 gal. : $\frac{292 \times 4}{14} = 83\frac{1}{2}$ gal. of 2d "

14 gal. : 292 gal. :: 7 gal. : $\frac{292 \times 7}{14} = 146$ gal. of 3d

(103)

$$£\frac{1}{2} + £\frac{1}{2} + £\frac{1}{2} + £\frac{1}{2} = £1\frac{1}{2}$$

$$\begin{aligned} \text{Then } £1\frac{1}{2} : £500 :: £\frac{1}{2} : £500 \times \frac{1}{2} \times \frac{4}{7} &= \frac{£15000}{77} \\ &= £194 \text{ 16s. } 1\frac{1}{2}\text{d} \end{aligned}$$

$$\begin{aligned} £1\frac{1}{2} : £500 :: £\frac{1}{2} : £500 \times \frac{1}{2} \times \frac{4}{7} &= \frac{£10000}{77} \\ &= £129 \text{ 17s. } 4\frac{1}{2}\text{d}. \end{aligned}$$

$$\begin{aligned} £1\frac{1}{2} : £500 :: £\frac{1}{2} : £500 \times \frac{1}{2} \times \frac{4}{7} &= \frac{£7500}{77} \\ &= £97 \text{ 8s. } 0\frac{1}{2}\text{d}. \end{aligned}$$

$$\begin{aligned} £1\frac{1}{2} : £500 :: £\frac{1}{2} : £500 \times \frac{1}{2} \times \frac{4}{7} &= \frac{£6000}{77} \\ &= £77 \text{ 18s. } 5\frac{1}{2}\text{d}. \end{aligned}$$

$$= \sqrt{\frac{t}{P}}$$

$$04) \div 11$$

$$\div 11$$

$$925$$

to the loga-

nd rate per

$$= 117.$$

f 1st kind.

al. of 2d "

al. of 3d

$$\text{£}15000$$

$$77$$

$$\text{£}10000$$

$$77$$

$$\text{£}7500$$

$$77$$

$$\text{£}6000$$

$$77$$

(104)

By Table, page 363, present value of annuity of \$1 at 6 per cent. for 23 payments = \$12.30338.

Hence present value of \$100 = \$12.30338 \times 100 = \$1230.338.

By Formula V, page 361, $v = \frac{a}{r} \left\{ 1 - \frac{1}{(1+r)^t} \right\}$

$$= \frac{100}{.06} \times \left(1 - \frac{1}{(1.06)^{23}} \right) = \frac{10000}{6} \times (1 - 0.25583)$$

$$= \frac{10000}{6} \times 0.74417 = \frac{7441.7}{6} = \$1240.28.$$

(105)

Since each loses 1 hour per day for 24 days, the whole hours lost = 24×25 .

Also, 5 men working 1 hour per day for 12 days make up $5 \times 12 \times 1 = 60$ hours.

Hence they will each have to work as many hours per day as 60 hours is contained times in 24×25 hours *i. e.* $\frac{24 \times 25}{60} = 10$ hours.

(106)

$$a = 5, s = 161 \text{ and } d = 6$$

Then Formula II, p. 333. $l = -\frac{1}{2}d + \sqrt{2d6 \div (a - \frac{1}{2}d)^2} = -\frac{1}{2} \text{ of } 6 + \sqrt{2 \times 6 \times 161 + (5 - \frac{1}{2} \text{ of } 6)^2} = -3 + \sqrt{1932 + 4} = -3 + \sqrt{1936} = -3 + 44 = 41 \text{ years.}$

(107)

$$6^3 : 10^3 :: 1 \text{ day} : \frac{10^3 \times 1}{6^3} = \frac{1000}{216} = 4.629 \text{ days.}$$

$$\begin{aligned} * \text{ Log. } \frac{1}{(1.06)^{23}} &= \text{log. } 1 - \text{log. } 1.06 \times 23 = 0 - 0.025908 \times 23 \\ &= 0 - 0.592083 = \bar{1}.407902 \end{aligned}$$

$$\therefore \frac{1}{(1.06)^{23}} = \text{natural number corresponding to the logarithm}$$

$\bar{1}.407902$, which is 0.25583.

(108)

For 12 months he was to receive £8 and a suit of clothes; for 7 months he received £2 13s. 4d. and the suit of clothes; \therefore for 5 months he would have received the difference between £8 and £2 13s. 4d., which is £5 6s. 8d.

Hence for 1 month he would have received $£5\ 6s.\ 8d. \div 5$, which is £1 1s. 4d., and hence his wages for the year would have been, in money alone, £1 1s. 4d. $\times 12$ i. e. £12 16s.

Therefore the suit of clothes was valued at £12 16s. — £8 = £4 16s.

TENTH SERIES.

(109)

$\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$; if $\frac{13}{12}$ of a number = 48, $\frac{1}{12}$ will = $48 \div 13 = 3\frac{2}{13}$.
If $3\frac{2}{13} = \frac{40}{13}$, $\frac{1}{13}$, or the whole number = $3\frac{2}{13} \times 12 = 44\frac{4}{13}$.

(110)

$$6^3 : 8^3 :: 600 : \frac{600 \times 8^3}{6^3} = \frac{600 \times 512}{216} = 1422\cdot2 \text{ lbs.}$$

(See Art. 33, sec. X.)

(111)

Part of ball remaining after 1st has taken off her share = $\frac{3}{4}$

Then whole ball : remainder :: cube of diameter of whole : cube of diameter of remainder

$$1 : \frac{3}{4} :: 5^3 : x^3 \text{ hence } x = \sqrt[3]{\frac{3}{4} \times 125} = \sqrt[3]{93\cdot75} = \sqrt[3]{93\cdot75} = 4\cdot542$$

\therefore Part taken off by 1st = 5 in. — 4·542 in. = 0·458 in.

After 2nd had taken off her portion $\frac{1}{4}$ of the ball remained.

$$1 : \frac{1}{4} :: 5^3 : x^3, \text{ hence } x = \sqrt[3]{\frac{1}{4} \times 125} = \sqrt[3]{31\cdot25} = \sqrt[3]{31\cdot25} = 3\cdot149 \text{ in.}$$

\therefore Part taken off by 2nd = 4·542 — 3·149 = 1·393 in.

After 3rd had taken off her share there remained $\frac{1}{4}$ of the ball.

$$1 : \frac{1}{4} :: 5^3 : x^3, \text{ hence } x = \sqrt[3]{\frac{1}{4} \times 125} = \sqrt[3]{31\cdot25} = 3\cdot149 \text{ in.}$$

\therefore Part taken off by 3rd = 3·149 — 3·149 = 0 inches

Remainder = 3·149 = part taken off by 4th.

other; for 7
of clothes;
ference be-

8s. 8d. ÷ 5,
year would
e. £12 16s.
16s. — £8

$8 \div 13 = 3\frac{2}{13}$
 $= 44\frac{4}{13}$.

re = $\frac{3}{4}$
ole : cube

$5 = 4.542$
8 in.
ined.
= 3.968 in.
n.
the ball.
-149 in.
inches

$$71213 \cdot 43 \div 12 \cdot 342 = 71213430 \div 12342$$

$$12342) 71213430 (5570 \cdot 238552$$

62831

72724

62831

87833

87525

3070.0

2468.4

500.50

371.36

118.130

111.067

7.0520

6.2831

.65780

.62831

.028480

.024684

.003685

(112)

IX.

$$5570 \cdot 238552 (71 \cdot 118 = \text{sq. rt.}$$

54

151) 170

151

1521) 18.23

15.21

15221) 3.0285

1.5221

152228) 1.406452

1.360281

.036411

NOTE.—Unless the quotient is carried out to *six places* of decimals, i. e., twice as many as are required in the root, the last figure in the root will be 7 or 6.

(113)

$$\begin{array}{l} \text{1st} \left\{ \begin{array}{l} \$60 \times 48 = \$2880 \text{ for 1 month} \\ \$800 \times 43 = 34400 \text{ for 1 month} \\ \$1500 \times 4 = 6000 \text{ for 1 month} \end{array} \right\} = \$43280 \text{ for 1 month.} \\ \quad \text{Sum} = \$43280 \\ \text{2nd} \left\{ \begin{array}{l} \$600 \times 48 = \$28800 \text{ for 1 month} \\ \$1800 \times 42 = 75600 \text{ for 1 month} \end{array} \right\} = \$104400 \text{ for 1 month.} \\ \quad \text{Sum} = \$104400 \end{array}$$

(Continued on next page.)

(113 continued.)

3rd	{	\$400 × 48 =	\$19200	}	= \$103200 for 1 month.
		\$500 × 42 =	21000		
		\$500 × 36 =	18000		
		\$500 × 30 =	15000		
		\$500 × 24 =	12000		
		\$500 × 18 =	9000		
		\$500 × 12 =	6000		
		\$500 × 6 =	3000		
		Sum = \$103200			
4th	{	\$900 × 40 =	\$36000	}	= \$138600 for 1 month.
		\$900 × 34 =	30600		
		\$900 × 28 =	25200		
		\$900 × 22 =	19800		
		\$900 × 16 =	14400		
		\$900 × 10 =	9000		
		\$900 × 4 =	3600		

\$43280

104400

103200

138600

4 years at \$1.25 per day
 = \$1.25 × 4 × 365 = \$1825 = share of 5th.

\$389480 for one month.

\$20000 - \$1825 = \$18175 = sum to be divided among the four.

\$389480 : \$18175 :: \$43280 : \$2019.651 = share of 1st.

\$389480 : \$18175 :: \$104400 : \$4871.803 = " 2nd.

\$389480 : \$18175 :: \$103200 : \$4815.805 = " 3rd.

\$389480 : \$18175 :: \$138600 : \$6467.739 = " 4th.

(114)

Simple Interest, formula IX, p. 248. $t = \frac{n-1}{r} = \frac{16-1}{.05} = \frac{15}{.05} = 300$ years.

Compound Interest, formula V, p. 354. $t = \frac{\log. n}{\log. (1+r)}$

$$= \frac{\log. 16}{\log. 1.05} = \frac{1.204120}{0.021189} = \frac{1204120}{21189} = 56.827 \text{ years.}$$

(115)

For every \$1 the first gave, the second gave \$3 and the third \$6. $\$1 + \$3 + \$6 = \10 .

Hence the 1st gave \$1, the second \$3, and the third \$6 as often as \$10 is contained times in \$9202, which is $920\frac{1}{2}$ times.

$$\$1 \times 920\frac{1}{2} = \$920.20 = \text{payment of 1st person.}$$

$$\$3 \times 920\frac{1}{2} = \$2760.60 = \quad \quad \quad \text{2nd "}$$

$$\$6 \times 920\frac{1}{2} = \$5521.20 = \quad \quad \quad \text{3rd "}$$

(116)

$$25 + 22 = 47 = \text{whole number of men.}$$

$$165 \div 47 = 3\frac{1}{2} = \text{acres cleared by each man.}$$

$$3\frac{1}{2} \times 22 = 77\frac{1}{2} \text{ acres} = \text{acres cleared by company of 22 men.}$$

$$165 \text{ acres} - 77\frac{1}{2} \text{ acres} = 87\frac{1}{2} \text{ acres} = \text{acres cleared by company of 25 men.}$$

1st company contains 3 more men than 2nd company and receives \$86 more.

Therefore \$86 pays 3 men. Hence each man gets $\$86 \div 3 = \$28.66\frac{2}{3}$.

Each man clears $3\frac{1}{2}$ acres, and receives $\$28.66\frac{2}{3}$ for it; therefore cost of 1 acre = $\$28.66\frac{2}{3} \div 3\frac{1}{2} = \$8\frac{2}{3}$.

(117)

$$15^2 = 225; 346 - 225 = 121 = \text{square of the less.}$$

$$\text{Hence less} = \sqrt{121} = 11.$$

(118)

Formula V, page 248, $A = P(1 + rt) = \$1200 \times 1.95 = \2340.00 .

(119)

$$\begin{array}{r|l} 24 : 496 & \\ 9 : 11 & \\ 7 : 4 & \\ \hline 465 : 537\frac{1}{2} & :: 5\frac{1}{2} : x \\ 3\frac{1}{2} : 5\frac{1}{2} & \\ 2\frac{1}{2} : 3\frac{1}{2} & \end{array}$$

(Continued on next page.)

(119 continued.)

$$\begin{array}{ccccccc}
 & & 3 & & & & \\
 & & 2 & & & & \\
 81 & & 27 & 2 & & & \\
 81 & & 184 & 4 & & & \\
 484 & 11 & 4 & 475 & 28 & 7 & 11 & 1 & 1 & 1 & 1 \\
 \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{1}{2} \times \frac{1}{5} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{24} \times \frac{1}{8} \times \frac{1}{8} \times \frac{1}{7} \times \frac{1}{465}
 \end{array}$$

$$\times \frac{8}{11} \times \frac{8}{7} = 11 \times 4 \times 3 = 132 \text{ days.}$$

(120)

$$\begin{array}{lcl}
 A + B + C & = & \frac{47}{80} \\
 B + C + D & = & \frac{27}{80} \\
 A + C + D & = & \frac{48}{80} \\
 A + B + D & = & \frac{46}{80} \\
 \hline
 3A + 3B + 3C + 3D & = & \frac{168}{80} \\
 \therefore A + B + C + D & = & \frac{56}{80}
 \end{array}
 \quad
 \begin{array}{lcl}
 A + B + C + D & = & \frac{56}{80} \\
 A + B + C & = & \frac{47}{80} \\
 \therefore D & = & \frac{9}{80} = \frac{1}{8} \\
 A + B + C + D & = & \frac{56}{80} \\
 B + C + D & = & \frac{27}{80} \\
 \therefore A & = & \frac{29}{80} = \frac{1}{3} \\
 A + B + C + D & = & \frac{56}{80} \\
 A + C + D & = & \frac{48}{80} \\
 \therefore B & = & \frac{8}{80} = \frac{1}{10} \\
 A + B + C + D & = & \frac{56}{80} \\
 A + B + D & = & \frac{46}{80} \\
 \therefore C & = & \frac{10}{80} = \frac{1}{8}
 \end{array}$$

$\frac{9}{80} : \frac{80}{80} :: \frac{1}{8} : \frac{1}{8} \times \frac{160}{80} \times \frac{80}{80} = \frac{1}{8} = D$'s true share which is therefore $= \frac{1}{8}$ of \$6213 = \$1090.

$\frac{29}{80} : \frac{80}{80} :: \frac{1}{3} : \frac{1}{3} \times \frac{80}{80} \times \frac{80}{80} = \frac{29}{80} = A$'s true share which is therefore $= \frac{29}{80}$ of \$6213 = \$2180.

$\frac{8}{80} : \frac{80}{80} :: \frac{1}{10} : \frac{1}{10} \times \frac{80}{80} \times \frac{80}{80} = \frac{8}{80} = B$'s true share which is therefore $= \frac{8}{80}$ of \$6213 = \$1635.

$\frac{10}{80} : \frac{80}{80} :: \frac{1}{8} : \frac{1}{8} \times \frac{80}{80} \times \frac{80}{80} = \frac{10}{80} = C$'s true share which is therefore $= \frac{10}{80}$ of \$6213 = \$1308.

ELEVENTH SERIES.

(121)

$$8 \cdot 671347 = 8^{87}_{999} \frac{1}{999}, I = 8^{87}_{999} \frac{1}{999} = 8^{111}_{999}$$

(122)

713 unden. = 816 den.; 291 unden. = 342 den.; 311 unden.
= 474 den.

Then $7.3 \overset{291}{\text{---}} \text{und } 1. = 861\cancel{344} \text{ den.} = 861\frac{4}{9} \text{ den.}$

12123 quat. = 11 den; 11223 qua. 363 den.; 100000 quat.
= 1024 den.

Then $12123 \frac{11333}{10000} = 411 \frac{333}{1024} \text{ den.}$

(123)

$3\frac{3}{4}$ of $2\frac{1}{2}$ of $7\frac{1}{10}$ of £1 = $\frac{27}{8}$ of $\frac{1}{2}$ of $\frac{1}{10}$ of £1
 = £ $\frac{27}{160}$ = £56 1 2 $\frac{1}{10}$
 $9\frac{3}{4}$ of $3\frac{3}{4}$ of 1s. = $\frac{69}{8}$ of $3\frac{3}{4}$ of 1s. = $\frac{119}{8}$ s..... = 1 16 8
 $8\frac{1}{4}$ of $4\frac{1}{8}$ of 1d. = $\frac{1}{8}$ of $3\frac{3}{4}$ of 1d. = $\frac{109}{32}$ d... = 0 2 10 $\frac{1}{32}$
 Sum = £58 0 8 $\frac{1}{160}$

$$\frac{1}{2} \text{ of } \frac{5}{4} \text{ of } \frac{3}{8} \text{ of } 3\frac{1}{2} \text{ d.} = \frac{1}{2} \times \frac{5}{4} \times \frac{3}{8} \times \frac{7}{2} = \frac{55}{128} \text{ d.}$$

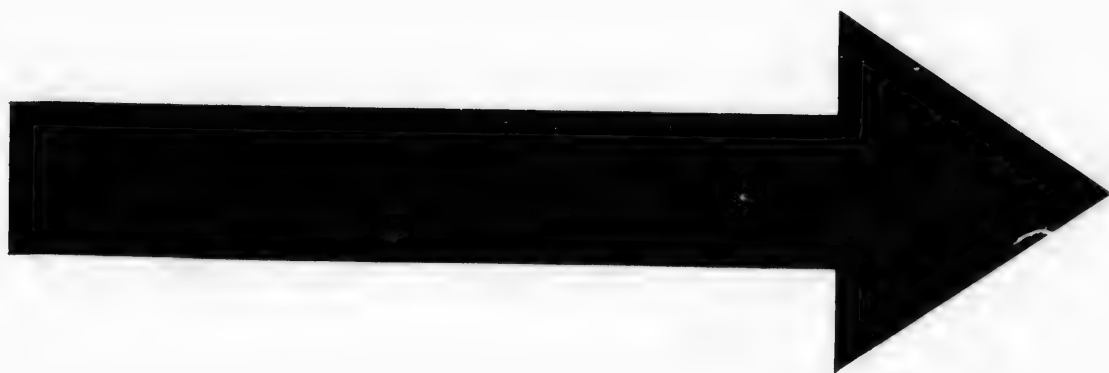
$$£58 \text{ os. } 8\frac{21}{60} \text{ d.} = \frac{2228501}{160} \text{ d.}$$

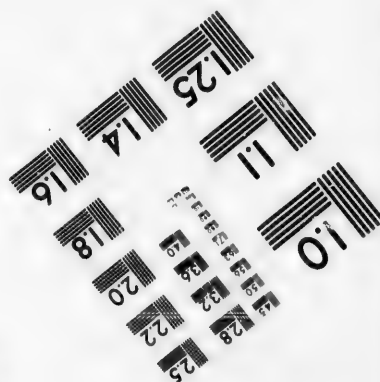
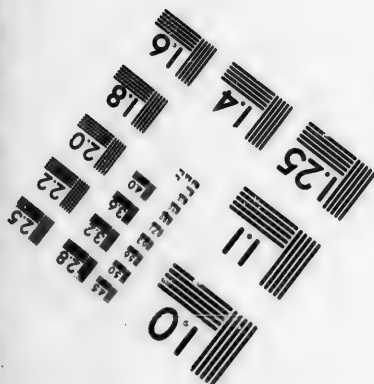
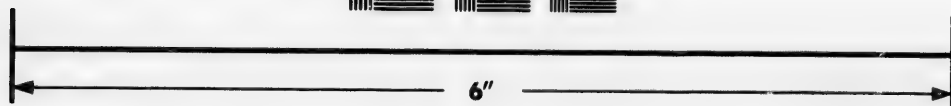
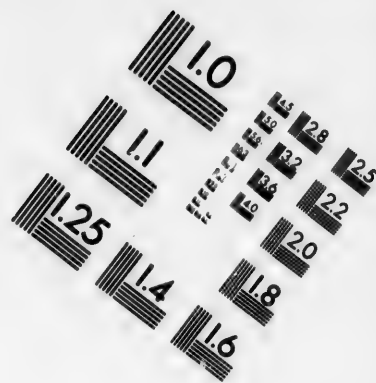
$$\frac{3238501}{160} \div \frac{55}{128} = \frac{3238501}{160} \times \frac{22}{11} = \frac{3238501}{80} \times \frac{1}{5} = \frac{3238501}{400}$$

(124)

$$\begin{array}{l} 24 : 90 \\ 2\frac{1}{2} : 4\frac{5}{6} \\ 12\frac{1}{2} : 9\frac{5}{6} \quad \therefore 139\frac{1}{2} : x \\ 4\frac{7}{8} : 4\frac{1}{2} \\ 3\frac{1}{8} : 2\frac{1}{2} \end{array}$$

(Continued on next page.)





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(129)

7 means + 2 extremes = 9 terms.

Formula XIII, p. 340. $r = \left(\frac{l}{a}\right)^{\frac{1}{n-1}} = \left(\frac{19683}{3}\right)^{\frac{1}{8}} = (6561)^{\frac{1}{8}} = 3$

Hence means are 9, 27, 81, 243, 729, 2187, and 6561.

(130)

Formula XXI, p. 344. $s = \frac{a}{1-r} = \frac{7}{1-\frac{1}{4}} = \frac{7}{\frac{3}{4}} = \frac{28}{3} = 9\frac{1}{3}$.

(131)

Part remaining after 1st has received his share = $\frac{3}{4}$. $1 : \frac{3}{4} :: 60^2 : x^2$; whence $x = \sqrt{3600 \times \frac{3}{4}} = \sqrt{900 \times 3}$
 $= 30\sqrt{3} = 1.732 \times 30 = 51.96$ inches.Hence 1st ground off $60 - 51.96 = 8.04$ inches.Part remaining after 2nd had taken off his share = $\frac{1}{4}$. $1 : \frac{1}{4} :: 60^2 : x^2$; whence $x = \sqrt{3600 \times \frac{1}{4}} = 30\sqrt{2}$
 $= 1.4142 \times 30 = 42.426$.Hence 2nd ground off $51.96 - 42.426 = 9.534$ inches.Part remaining after the 3rd had taken off his share = $\frac{1}{8}$. $1 : \frac{1}{8} :: 60^2 : x^2$; whence $x = \sqrt{3600 \times \frac{1}{8}} = \sqrt{900} = 30$ inches.Hence 3rd ground off $42.426 - 30$ inches = 12.426 inches,
and the 4th ground off remaining 30 inches.

(132)

1 guinea = 21s.

1 half-guinea = 10½s.

1 crown = 5s.

1 half-crown = 2½s.

1 shilling = 1s.

Sixpence = ½s.

Sum = 40½s.

100 guineas = 2100 shillings.

 $2100 \div 40\frac{1}{2} = 51$ times and re-
mainder, 69 half-shillings.69 half-shil. = $\frac{69}{2}$ s. = $34\frac{1}{2}$ s. = 17½s.

TWELFTH SERIES.

(133)

$$\frac{3}{11} \text{ of } \frac{2}{9} \text{ of } \frac{4}{17} = \frac{8}{561}; \frac{2\frac{1}{2}}{4\frac{1}{2}} \text{ of } \frac{2}{5} = \frac{10}{17} \text{ of } \frac{2}{5} = \frac{4}{17}.$$

$$\frac{8}{561} : \frac{4}{17} :: \$12\frac{4}{3} : \$12\frac{4}{3} \times \frac{4}{17} \times \frac{561}{8} = \frac{\$200}{88} \times \frac{4}{17} \times \frac{561}{8}$$

$$= \$200.$$

(134)

By Formula III, page 354, $r = \sqrt[t]{\frac{A}{P}} - 1 \therefore r + 1 = \sqrt[t]{\frac{A}{P}}$

$$\therefore \text{Log. } (1 + r) = (\text{log. } A - \text{log. } P) \div t$$

$$= (\text{log. } 1679.40 - \text{log. } 700.90) \div 5$$

$$= (3.225154 - 2.845656) \div 5.$$

$$= 0.379498 \div 5 = 0.075894.$$

$\therefore 1 + r = \text{nat. num. corresponding to the logarithm } 0.075894$
 which is 1.19, $\therefore r = .19 = \text{rate per unit, and hence rate per cent.} = 19.$

(135)

Having paid 10 per cent. he had 90 per cent. remaining.

$$\frac{90}{100} \text{ or } \frac{9}{10} \text{ of his salary} = \$1250, \therefore \frac{1}{10} = \frac{1250}{9} = \$138\frac{2}{9}.$$

$$\text{If } \$138\frac{2}{9} = \frac{1}{10}, \text{ the whole} = \$138\frac{2}{9} \times 10 = \$1388.888.$$

(136)

21 children receive 21 times a child's share

21 women " 42 " "

21 men " 63 " "

Together they receive 126 " "

$$£8 \text{ 13s. 6d.} \div 126 = 7\text{d.} = \text{a child's share.}$$

$$7\text{d.} \times 2 = 1\text{s. 2d.} = \text{a woman's share.}$$

$$7\text{d.} + 1\text{s. 2d.} = 1\text{s. 9d.} = \text{a man's share.}$$

(137)

A gets 1 time A's share.
 B " 1 " A's "
 C " 2 " A's "
 D " 4 " A's "

Together they get 8 times A's share.

$\$200 \div 8 = \$25 = \text{A's share}; \$25 = \text{B's share.}$

$\$25 + \$25 = \$50 = \text{C's share}; \$25 + \$25 + \$50 = \$100 = \text{D's share.}$

(138)

$$\sqrt[3]{3} = \frac{1}{3} \sqrt{18} = \frac{1}{3} \text{ of } 2.62074 = .87358$$

$$\sqrt[3]{3} = \frac{1}{3} \sqrt{6} = \frac{1}{3} \text{ of } 2.44948 = .81649$$

$$\text{Difference} = .05709$$

(139)

$\frac{3278}{91207}$ when each term is divided by 121, becomes $\frac{27}{837}$.
 $17\frac{5}{12} + \frac{1}{6} + 144\frac{1}{12} = 161 + \frac{5}{12} + \frac{1}{6} + \frac{1}{12} = 161 + \frac{17}{12} + \frac{1}{12}$
 $+ \frac{238}{12} = 161 + \frac{497}{12} = 161 + 1\frac{87}{12} = 162\frac{37}{12} = 162\frac{29}{12}$
 $2\frac{1}{3} - \frac{1}{6} = 2\frac{2}{6} - \frac{1}{6} = 1\frac{1}{6} = 1\frac{17}{12} - \frac{1}{12} = 1\frac{16}{12}$

$$\begin{array}{ccccccc} 3 & 6 & 4 & 15 & 21 & 54 \\ - \text{ of } - & \text{ of } - & \text{ of } - & \text{ of } - & \text{ of } - & = \\ 4 & 7 & 15 & 11 & 23 & 253 \end{array}$$

$$6347 \div 21 = 302\frac{1}{3} \div \frac{1}{3} = 302\frac{1}{3} \times \frac{3}{1} = 907$$

(140)

$$\begin{array}{r} 884736 \text{ (96 = cube root.} \\ 729 \end{array}$$

$$\begin{array}{r} 9^2 = 81 \times 300 = 24300 \\ 9 \times 6 = 54 \times 50 = 1620 \\ 6^2 = 36 \end{array}$$

$$25953 \quad 155736$$

$$95951\frac{1}{3} = 95951.2576.$$

(Continued on next page.)

(140 continued.)

$$\begin{array}{r} 95951 \cdot 2576 \\ \hline \end{array}$$

(309.76 = square root.

9

$$\begin{array}{r} 609 \) \ 5951 \\ \hline 5481 \\ \hline \end{array}$$

$$309 \cdot 76 \ (17 \cdot 6 = 17\frac{1}{2} = \text{fourth root.}$$

1

$$\begin{array}{r} 618 \cdot 7 \) \ 470 \cdot 25 \\ \hline 433 \cdot 09 \\ \hline \end{array}$$

$$\begin{array}{r} 29 \) \ 209 \\ \hline 189 \\ \hline \end{array}$$

$$\begin{array}{r} 619 \cdot 46 \) \ 37 \cdot 1676 \\ \hline 37 \cdot 1676 \\ \hline \end{array}$$

$$\begin{array}{r} 34 \cdot 6 \) \ 2076 \\ \hline 2076 \\ \hline \end{array}$$

(141)

250
300
400
500

$$1450:250::\$520:\frac{\$520 \times 250}{1450} = \$89\frac{1}{2} = \text{contrib. on 1st village.}$$

$$1450:300::\$520:\frac{\$520 \times 300}{1450} = \$107\frac{1}{5} = \text{ " } \quad 2d \quad \text{ "}$$

$$1450:400::\$520:\frac{\$520 \times 400}{1450} = \$143\frac{1}{5} = \text{ " } \quad 3d \quad \text{ "}$$

$$1450:500::\$520:\frac{\$520 \times 500}{1450} = \$179\frac{2}{5} = \text{ " } \quad 4th \quad \text{ "}$$

(142)

By Table on p. 362, the amount of \$1 for 34 payments at 3 per cent. = \$57.73018.

$$\$57.73018 \times 260 = \$15009.64.$$

By Formula I, page 361, $A = \frac{a \{(1+r)^t - 1\}}{r}$,

$$\begin{aligned} &= \frac{a}{r} \{(1+r)^t - 1\} = \frac{260}{.03} \{(1.03)^{34} - 1\} \\ &= \frac{26000}{3} \times (2.731855 - 1) = \frac{26000 \times 1.731855}{3} = \$15009.41. \end{aligned}$$

(143)

By Formula IX, p. 333, $d = \frac{l-a}{n-1} = \frac{79-2}{6-1} = \frac{77}{5} = 15\frac{2}{5}$.

Hence the series is 2, $17\frac{2}{5}$, $32\frac{4}{5}$, $48\frac{1}{5}$, $63\frac{3}{5}$, and 79.

Formula I, p. 333. $l = a + (n-1)d = 3 + (9-1) \times 4 = 3 + 8 \times 4 = 3 + 32 = 35$.

Formula VI, p. 333. $s = \left\{ 2a + (n-1)d \right\} \frac{n}{2}$
 $= \left\{ 2 \times 3 + (207-1) \times 4 \right\} \frac{207}{2} = (6 + 206 \times 4) \frac{207}{2}$
 $= (6 + 824) \times \frac{207}{2} = \frac{830 \times 207}{2} = 85905$.

(144)

B travels 4 miles per day faster than A, and will therefore gain the circumference of the island in $1\frac{3}{4} = 18\frac{1}{2}$ days.

C travels 10 miles per day faster than A, and will therefore gain the whole circumference of the island in $7\frac{3}{10} = 7\frac{3}{10}$ days.

Now B cannot be with A except at the end of $18\frac{1}{2}$ days, or twice $18\frac{1}{2}$ days, or three times $18\frac{1}{2}$ days, or some other multiple of $18\frac{1}{2}$ days.

Similarly C cannot be with A except at the end of $7\frac{3}{10}$ days, or of some other multiple of $7\frac{3}{10}$ days.

Therefore C and B will both be with A for the first time after the lapse of a number of days expressed by the least common multiple of $18\frac{1}{2}$ and $7\frac{3}{10}$.

The greatest common factor of $18\frac{1}{2}$ and $7\frac{3}{10}$ is $3\frac{1}{10}$.

Hence the l. c. m. of $7\frac{3}{10}$ and $18\frac{1}{2}$ is $\frac{7\frac{3}{10} \times 18\frac{1}{2}}{3\frac{1}{10}} = 36\frac{1}{2} =$ number

of days when A, B, and C will first be together.

fourth root.

1st village.

2d "

3d "

4th "

ents at 3 per

- 1}

- 1}

: \$15009.41,

ARITHMETICAL RECREATIONS.

1. The third of 6 = 2, and the fourth of 20 = 5.
Then if 2 becomes 3, what should 5 become? Evidently
7 $\frac{1}{2}$. *Ans.*

$$\begin{array}{l} 6 : 20 \\ \frac{1}{3} : \frac{1}{4} \end{array} \left. \vphantom{\begin{array}{l} 6 : 20 \\ \frac{1}{3} : \frac{1}{4} \end{array}} \right\} \text{or} \quad 3 : x = \frac{3 \times 20 \times \frac{1}{4}}{6 \times \frac{1}{3}} = 7\frac{1}{2}.$$

2. The half of 5 = 2 $\frac{1}{2}$; then if 7 becomes 2 $\frac{1}{2}$, what will 11 become?

$$\frac{2\frac{1}{2} \times 11}{7} = 4\frac{1}{2}. \quad \text{Lastly, what part of 9 is } 4\frac{1}{2}?$$

$$\frac{\frac{5}{2}}{\frac{9}{2}} = \frac{5}{9}. \quad \text{Ans.}$$

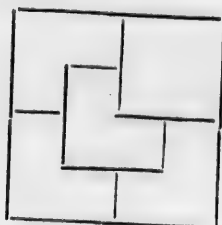
$$\begin{array}{l} 9 : 5 \\ 7 : 11 \end{array} \left. \vphantom{\begin{array}{l} 9 : 5 \\ 7 : 11 \end{array}} \right\} \text{or} \quad \frac{1}{7} : x = \frac{\frac{1}{9} \times 5 \times 11}{9 \times 7} = \frac{5}{81} = \frac{5}{81}. \quad \text{Ans.}$$

3. 99 $\frac{3}{4}$.
4. $\frac{1}{3}$ of 2d. = $\frac{1}{3}$ d. Then $\frac{1}{3}$ d. is what part of 3d.? *Ans.* $\frac{1}{9}$.
5. 1 $\frac{1}{2}$ d. for a herring and a half is at the rate of 1d. per herring; hence 11 herrings will cost 11d.
6. 12 apples = 21 pears = 7 cents.
If 12 apples cost 7 cents, what will 100 apples cost?

$$12 : 100 :: 7 : \frac{100 \times 7}{12} = 58\frac{1}{3} \text{ cents.}$$

7. If 5 is $\frac{3}{4}$ of a certain number, $\frac{1}{4}$ will be $\frac{1}{4}$ of 5, which is $\frac{5}{4}$.
If $\frac{5}{4}$ is $\frac{1}{4}$ of a certain number, the whole number will be
 $\frac{5}{4} \times 4 = 5 = 12\frac{1}{2}$. *Ans.*
8. The hurdles are arranged so as to form a rectangular enclosure having 49 hurdles on each side and one on each end. Two additional hurdles will give two hurdles to each end, and will thus double the size of the enclosure.
9. The mode of dividing the plot may be learned from the following figure:—

Evidently



10. $33\frac{1}{3}$.

11. XIII; rub out the lower half, and there remains the expression VIII = 8.

12. 1st Step: Fill the 3-gallon cask and empty it into the 5-gallon cask.

2nd Step: Again fill the 3-gallon cask out of the 8-gallon cask.

3rd Step: Fill up the 5-gallon cask out of the 3-gallon cask. This will leave one gallon in the latter.

4th Step: Empty the 5-gallon cask into the 8-gallon cask.

5th Step: Pour the one gallon out of the 3-gallon cask into the 5-gallon cask.

6th Step: Fill the 3-gallon cask out of the 8-gallon cask and empty it into the 5-gallon cask.

The following diagrams show this more clearly :

1st Step.



2nd Step.



3rd Step.



4th Step.



5th Step.



6th Step.



shows how the

I.	II.	III.	IV.	V.	VI.																																																						
<table><tr><td>3</td><td>3</td><td>3</td></tr><tr><td>3</td><td>P</td><td>3</td></tr><tr><td>3</td><td>3</td><td>3</td></tr></table>	3	3	3	3	P	3	3	3	3	<table><tr><td>4</td><td>1</td><td>4</td></tr><tr><td>1</td><td>P</td><td>1</td></tr><tr><td>4</td><td>1</td><td>4</td></tr></table>	4	1	4	1	P	1	4	1	4	<table><tr><td>2</td><td>5</td><td>2</td></tr><tr><td>5</td><td>P</td><td>5</td></tr><tr><td>2</td><td>5</td><td>2</td></tr></table>	2	5	2	5	P	5	2	5	2	<table><tr><td>1</td><td>7</td><td>1</td></tr><tr><td>7</td><td>P</td><td>7</td></tr><tr><td>1</td><td>7</td><td>1</td></tr></table>	1	7	1	7	P	7	1	7	1	<table><tr><td>0</td><td>9</td><td>0</td></tr><tr><td>9</td><td>P</td><td>9</td></tr><tr><td>0</td><td>9</td><td>0</td></tr></table>	0	9	0	9	P	9	0	9	0	<table><tr><td>5</td><td>0</td><td>4</td></tr><tr><td>0</td><td>P</td><td>0</td></tr><tr><td>4</td><td>0</td><td>5</td></tr></table>	5	0	4	0	P	0	4	0	5
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9	P	9																																																									
0	9	0																																																									
5	0	4																																																									
0	P	0																																																									
4	0	5																																																									
24	20	28	32	36	18																																																						

19. Represent the three husbands by A, B, and C, and their wives respectively by the letters a , b , and c .

I. A and a go over, a remains while A takes back the boat.

II. b and c go over and remain while a takes back the boat.

III. B and C go over, B remains while C and c take back the boat.

IV. A and C go over and remain while b takes back the boat.

V. a and b go over and remain while C takes back the boat.

VI. C. and c go over.

20.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

RULE FOR FILLING MAGIC SQUARES OF ODD NUMBER OF CELLS.

Begin in centre cell of top horizontal row by placing 1 in it; ascend diagonally to the right, and where this carries us beyond the square, transport the next number to the cell at the remote end of the vertical or horizontal band to which it belongs. When in ascending we come to a cell already filled we place the number in the cell next below the cell last filled. The following is a square of 7 cells in a side filled after this method;

s problem ;

30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	31	40	49	2	11	20

21. Half-a-dozen dozen = $6 \times 12 = 72$.

Six dozen dozen = $6 \times 12 \times 12 = 864$.

$864 - 72 = 792$. *Ans.*

22. The following shows the mode of performing this.
It will be observed that the two side-counters are
merely moved one counter higher when the other
two are taken away.

0
0 0
0
0
0
0
0
0

23. This problem admits of the following two solutions :

1st SOLUTION.

Persons.	Full bottles.	Hf.-full bottles.	Empty bottles.
1st	2	3	2
2nd	2	3	2
3rd	3	1	3
	<hr/> 7	<hr/> 7	<hr/> 7

Each person has $3\frac{1}{2}$ bottles of wine and 7 bottles.

2ND SOLUTION.

1st	3	1	3
2nd	3	1	3
3rd	1	5	1
	<hr/> 7	<hr/> 7	<hr/> 7

Each person, as before, has 7 bottles and $3\frac{1}{2}$ bottles of wine.

24. There were in all 8 bottles of wine, of which each drank $\frac{1}{4}$, which is 2 $\frac{1}{2}$. The third person, therefore, drank $\frac{1}{4}$ of a bottle belonging to him who had but 3 bottles, and $\frac{3}{4}$ of a bottle belonging to him who owned the 5 bottles. Hence the latter should have *seven* times as much of the money as the former, or, in other words, the latter gets 7 shillings and the former 1 shilling.

25. This problem is merely to find some number between 5 and 100 which is exactly divisible by 2 and by 3, but which divided by 5 leaves a remainder 3.

The only numbers between 50 and 100 that are divisible by both 2 and 3 are 54, 60, 66, 72, 78, 84, 90, and 96, and by inspection the only one of these which gives a remainder 3 when divided by 5 is 78; therefore the basket contained 78 eggs.

26. *Ans.* 1 lb., 3 lbs., 9 lbs., and 27 lbs.

For 1 lb. = 1 lb.; 2 lbs. = 3 lbs. — 1 lb., i. e. 3 lbs. in one scale and 1 lb. in the other; 3 lbs. = 3 lbs.; 4 lbs. = 3 lbs. + 1 lb.; 5 lbs. = 9 lbs. — (3 lbs. + 1 lb.); 6 lbs. = 9 lbs. — 3 lbs.; 7 lbs. = 9 lbs. + 1 lb. — 3 lbs.; 8 lbs. = 9 lbs. — 1 lb.; 9 lbs. = 9 lbs.; 10 lbs. = 9 + 1 lb.; 11 lbs. = 9 lbs. + 3 lbs. — 1 lb.; 13 lbs. = 9 lbs. + 3 lbs. + 1 lb.; 14 lbs. = 27 lbs. — (9 lbs. + 3 lbs. + 1 lb.); 15 lbs. = 27 lbs. — (9 lbs. + 3 lbs.); 16 lbs. = 27 lbs. + 1 lb. — (9 lbs. + 3 lbs.); 17 lbs. = 27 lbs. — (9 lbs. + 1 lb.); 18 lbs. = 27 lbs. — 9 lbs.; &c., &c.

27. In order to fill seven out of the eight points, it is merely requisite to remember that the second counter must be carried to the point from which the first *started*, the third to the point from which the second started, &c.

Thus if the first counter is carried from 1 to 4 and there deposited, the second must be taken from 6 to 1 and there deposited; the third from 3 to 6; the fourth from 8 to 3; the fifth from 5 to 8; the sixth from 2 to 5; and the seventh either from 7 to 2 or from 2 to 7.

28. The month fills the reservoir in 6 hours, therefore it fills $\frac{1}{6}$ in 1 hour; the right eye fills it in 48 hours, therefore it fills

0
0 0 0
this. 0
s are 0
other 0
0
0
ons: 0

empty bottles.

2
2
3
—
7

ss.

3
3
1
—
7

les of wine.

$\frac{1}{12}$ in 1 hour; the left eye fills it in 72 hours, therefore it fills $\frac{1}{72}$ in 1 hour; the foot fills it in 96 hours, therefore it fills $\frac{1}{96}$ in 1 hour. Hence together they fill $\frac{1}{6} + \frac{1}{72} + \frac{1}{96} = \frac{21}{96}$ in 1 hour, and to fill the reservoir they require $1 \div \frac{21}{96} = \frac{96}{21} = 4$ hours 43 min. 16 $\frac{2}{3}$ sec.

29. The person who thinks of the numbers must proceed as follows: He must multiply the 1st by 2 and add 5 to the product; he must next multiply this sum by 5 and add the second number to the product; he must next multiply this result by 10 and add the third number to the product; lastly, he must subtract 250 and name the remainder.

The three digits of the remainder will be the three numbers thought of, and will be in the order in which they were thought of.

The reason is obvious: let $a = 1$ st, $b = 2$ nd, and $c = 3$ rd number thought of.

$$a \times 2 + 5 = 2a + 5.$$

$$(2a + 5) \times 5 + b = 10a + b + 25.$$

$$(10a + b + 25) \times 10 + c = 100a + 10b + c + 250.$$

$$(100a + 10b + c + 250) - 250 = 100a + 10b + c = a \text{ in hundreds' place, } b \text{ in tens' place, and } c \text{ in units' place.}$$

30. Since each man possesses 63 square rods of land more than his son, we must form three pairs of numbers, such that the difference of their squares shall be 63.

The difference of the squares of two numbers is equal to their sum multiplied by their difference, and hence 63 must be divided into two factors in three distinct ways, thus:

$$63 = 63 \times 1 = 21 \times 3 = 9 \times 7.$$

If sum = 63 and difference = 1, the numbers are 32 and 31.

If sum = 21 and difference = 3, the numbers are 12 and 9.

If sum = 9 and difference = 7, the numbers are 8 and 1.

Hence the squares of Jones, Brown, and Smith, are respectively 32 rods, 12 rods, and 8 rods on the side, and the son's squares are respectively 31, 9, and 1 yards on the side.

Jones' piece was 23 rods longer on each side than Tom's, and since the difference between 32 and 9 is 23, we may conclude that Jones' square was 32 rods to the side, and Tom's 9 rods on a side.

3, therefore it
3, therefore it
 $\frac{1}{2} + \frac{1}{3} + \frac{1}{6}$
ervoir they re-
sec.

it proceed as
add 5 to the
5 and add the
multiply this
the product;
mainder.

three numbers
h they were

c = 3rd num-

c + 250.

10 b + c =
units' place.

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63 must be
thus:

e 32 and 31.

e 12 and 9.

8 and 1.

are respec-
nd the son's
e side.

Tom's, and
e may con-
and Tom's

Brown's piece was 11 rods longer on a side than Harry's, and since if the above numbers 12 and 1 have 11 for their difference, we may conclude that Brown's piece was 12 rods on a side, and Harry's piece 1 rod.

Hence Tom was Brown's son, Harry was Smith's son, and Ned was Jones' son.

31. The mode of arranging the crew may be remembered by attention to the vowels in the following line:

Populeam virgam maier regina ferebat.

The vowels refer to the crew as follows, $a = 1$, $e = 2$, $i = 3$, $o = 4$, and $u = 5$.

We begin with 4 whites because the first vowel is o, next $u = 5$ blacks, next $e = 2$ whites, next $a = 1$ black, next $i = 3$ whites, next $a = 1$ black, next $e = 2$ whites, next $e = 2$ blacks, &c., as follows, o standing for a white and + for a black.

oooo++++oo+ooo+o++++o++++oo+

32. You select the multiplier or the multiplicand, such that the sum of its digits shall be exactly divisible by nine. Hence upon the principle of the proof by casting out the nines, the product has the sum of its digits exactly divisible by nine. By subtracting the sum of the digits of the remainder from the next higher multiple of 9 you determine the digit crossed out.

Thus suppose you select 117, and he takes for multiplicand 21613. Then $21613 \times 117 = 2528721$. Now suppose he crosses out the 7; upon reading you the remaining digits 252821, you find that their sum = 20, which taken from 27 the next higher multiple of 9 leaves 7 the digit he crossed out.

If he crosses out a 0 or a 9, you cannot determine which, but in all other cases you can tell the exact figure.

33. You write the second, fourth, sixth, &c. lines in such a manner as to make the sum of the first pair, the sum of the second pair, &c. an exact number of 9's. Then having settled the number of pairs, you get the answer by multiplying by that number a row of 9's containing as many digits as there are to be figures in the line.

Thus suppose you agree to write 5 lines each, and that each line is to contain 5 digits, or not more than 5 digits. Then $99999 \times 5 = 499995$ will be the answer. This is shown as follows:

Suppose he writes 41113	}	= 99999	} = 99999 \times 5.
You write 58886			
Suppose he writes 61451	}	= 99999	
You write 38548			
Suppose he writes 6500	}	= 99999	
You write 93499			
Suppose he writes 1	}	= 99999	
You write 99998			
Suppose he writes 99999	}	= 99999	
You write 00000			
<hr/> Sum = 499995			

THE END.

[NAT. ARITH.

and that each
5 digits. Then
This is shown

$$= 99999 \times 5.$$



